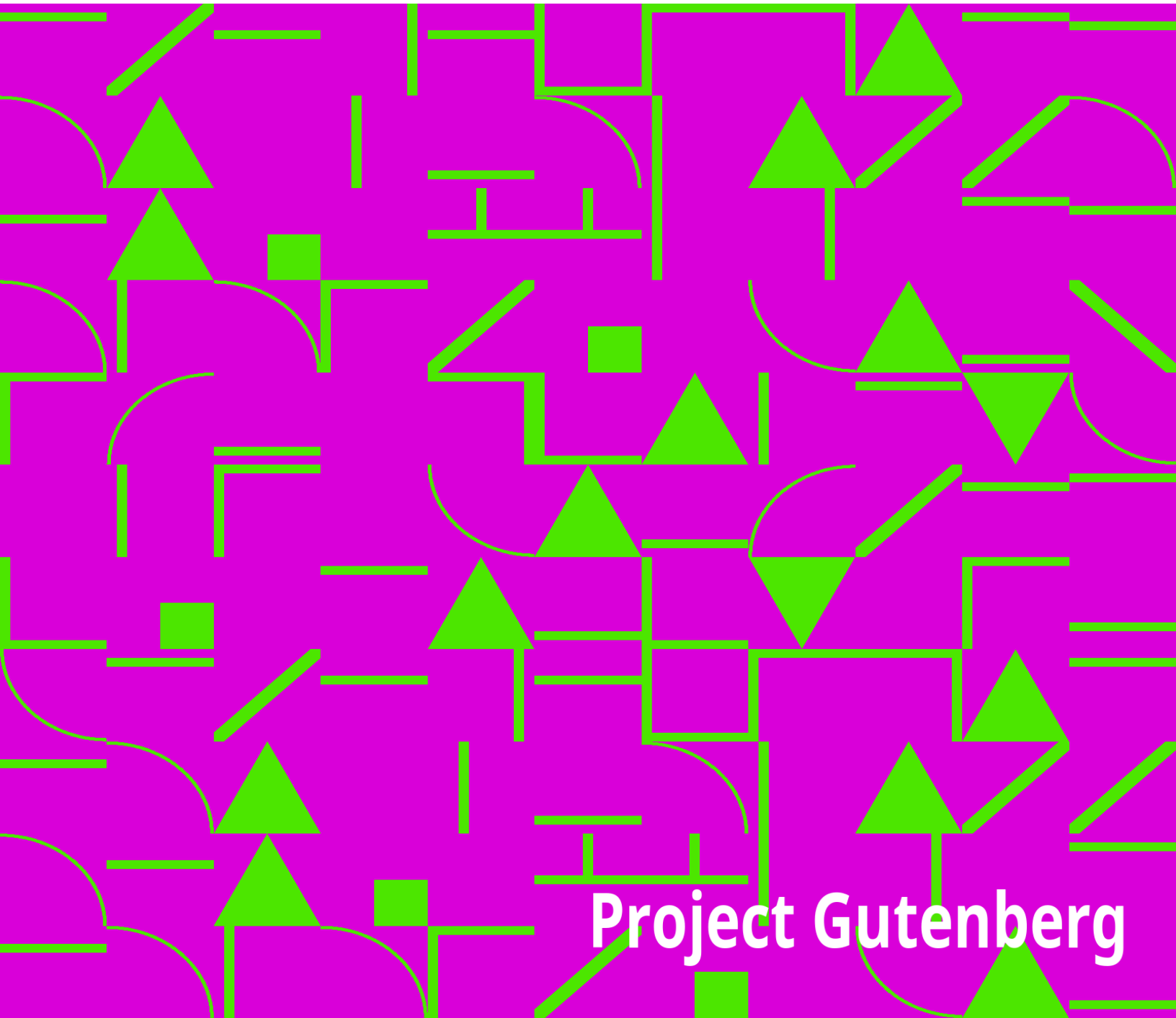
Encyclopaedia Britannica, 11th Edition, "Armour Plates" to "Arundel, Earls of"

Various



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THE ENCYCLOPÆDIA BRITANNICA

A DICTIONARY OF ARTS, SCIENCES, LITERATURE AND GENERAL INFORMATION

ELEVENTH EDITION

VOLUME II SLICE VI

Armour Plates to Arundel, Earls of

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ARMOUR PLATES. The earliest recorded proposal to employ armour for ships of war (for body armour, &c., see ARMS AND ARMOUR) appears to have been made in England by Sir William Congreve in 1805. In *The Times* of the 20th of February of that year reference is made to Congreve's designs for an armoured, floating mortar battery which the inventor considered would be proof against artillery fire. Among Congreve's unpublished papers there is also a suggestion for armour-plating the embrasures of casemates. Nothing, however, seems to have come of these proposals, and a similar lack of appreciation befell the next advocate of armour, John Stevens of New Jersey, U.S.A., who submitted the plans of an armoured vessel to Congress in 1812. The Stevens family, however, continued to work at the subject, and by 1841 had determined by actual experiment the thickness of wrought-iron armour which was proof against the projectiles then in use. The necessity for armouring ships as a protection against shell fire was again pointed out by General Paixhans in 1841, and in 1845 Dupuy de Lôme had prepared the designs of an armoured frigate for the French government. During the period between 1827 and 1854, experiments in connexion with the proposed application of armour to both ships and forts were carried out in England, the United States and France, but the question did not get beyond the experimental stage until the latter year, when armoured floating batteries were laid down in all three countries, probably as the immediate outcome of the destruction of the Turkish fleet by shell fire at Sinope on the 30th of November 1853.

Defence for ships.

History.

Three of the French floating batteries were in action at the bombardment of Kinburn in 1855, where they achieved a conspicuous success, silencing the Russian forts after a four hours' engagement, during which they themselves, although frequently struck, were practically uninjured, their loss in personnel being but trifling. To quote Very: "This comparatively insignificant action, which had little if any effect upon the course of the

Crimean War, changed the whole condition of armour for naval use from one of speculation to one of actual and constant necessity." The military application of armour for the protection of guns mounted in permanent fortifications followed. Its development, however, took rather a different course, and the question of armour generally is of less importance for the military engineer than for the naval constructor. For the employment of armour in ship construction and in permanent works on land, see the articles SHIPBUILDING; FORTIFICATION AND SIEGECRAFT; the present article is concerned solely with the actual armour itself.

Construction and testing.

The earliest armour, both for ships and forts, was made of wrought iron, and was disposed either in a single thickness or in successive layers sandwiched with wood or concrete. Such armour is now wholly obsolete, though examples of it may still be found in a few forts of early date. The chief application of armour in modern land defences is in the form of shields for the protection of guns mounted *en barbette*. Examples of such shields are shown in figs. 1 and 2. Fig. 1 shows a 4.5-in. steel shield for the U.S.A. government, face-hardened by the Harvey process, to which reference is made below. It was attacked by 5-in. and 6-in. armour-piercing shot, and proved capable of keeping out the 5-in. up to a striking velocity of nearly 1800 ft. per second, but was defeated by a 6-in. capped A.P. shot with a striking velocity of 1842 ft. per second. The mounting was not seriously damaged by the firing, but could be operated after the impact of one 3.2-in., five 5-in. and three 6-in. projectiles. Fig. 2 shows a gun-shield, manufactured by Messrs Hadfield of Sheffield, after attack by 4.1-in., 4.7-in. and 6-in. armour-piercing and other projectiles. The limit of the shield's resistance was just reached by an uncapped 4.7-in. A.P. shell with a striking velocity of 2128 ft. per second. The shield (the average maximum thickness of which was 5.8 in.) showed great toughness, and although subjected to a severe battering, and occasionally outmatched by the attacking projectiles,

developed no visible crack. It is chiefly remarkable for the fact that it was cast and not forged. As is evident from the fringing around the hole made by the 6-in. A.P. shell, the shield was not face-hardened. A more highly developed form of the gun-shield is to be found in the armoured cupola, which has been employed to a very considerable extent in permanent fortifications, and whose use is still strongly advocated by continental European military engineers. The majority of the cupolas to be found in continental forts are not, however, of very recent date, those erected in 1894 at Molsheim near Strassburg being comparatively modern instances. Any cupolas constructed nowadays would be of steel, either forged or cast, and would probably be face-hardened, but a large number of those extant are of compound or even of iron armour. Many of those on sea-fronts are made of chilled cast iron. Such armour, which was introduced by Gruson of Magdeburg in 1868, is extremely hard, and cannot be perforated, but must be destroyed by fracture. It is thus the antithesis of wrought iron, which, when of good quality, does not break up under the impact of the shot but yields by perforation. Armour of the Gruson type is well adapted for curved surfaces such as cupolas, which on account of their shape are scarcely liable to receive a direct hit, except at distant ranges, and its extreme hardness would greatly assist it to throw off shot striking obliquely, which have naturally a tendency to glance. Chilled iron, on account of its liability to break up when subjected to a continuous bombardment by the armour-piercing steel projectiles of guns of even medium calibre, was usually considered unsuitable for employment in inland forts, where wrought iron, mild steel or compound armour was preferred. On the other hand, as pointed out by the late Captain C. Orde Browne, R.A., it was admirably adapted to resist the few rounds that the heavy guns of battleships might be expected to deliver during an attack of comparatively limited duration.

Chilled iron was never employed for naval purposes, and warship armour continued to be made exclusively of wrought iron until 1876 when steel

was introduced by Schneider. In an important trial at Spezzia in that year the superiority in resisting power of steel to wrought iron was conclusively proved, but, on the other hand, steel showed a great tendency to through-cracking, a defect which led Messrs Cammell of Sheffield in 1877 to introduce compound armour consisting of a steel surface in intimate union with a wrought-iron foundation plate. In Cammell plates, which were made by the Wilson process, the steel face was formed by running molten steel on to a white-hot foundation plate of iron, while in the compound plates, made by Messrs John Brown & Co. according to the patent of J.D. Ellis, a thin steel surface plate was cemented on to the wrought-iron foundation by running in molten steel between. Compound armour possessed the advantages of a harder face than was then possible in a homogeneous steel plate, while, on the other hand, the back was softer and less liable to crack. Its weak point was the liability of the surface plate to crack through under fire and become detached from its iron backing. The manufacture of steel, however, continued to improve, so that in 1890 we find steel plates being made which were comparatively free from liability to through-cracking, while their power to resist perforation was somewhat greater than that of the best compound. The difference, however, was at no time very marked, and between 1880 and 1890 the resistance to perforation of either steel or compound as compared with wrought iron may be taken as about 1.3 to 1.

Compound armour required to be well backed to bring out its best qualities, and there is a case on record in 1883 when a 12-in. Cammell plate weighing 10½ tons, backed by granite, stopped a 16-in. Palliser shot with a striking energy of nearly 30,000 foot tons and a calculated perforation of 25 inches of wrought iron. As steel improved, efforts were made to impart an even greater hardness to the actual surface or skin of compound armour, and, with this object in view, Captain T.J. Tresidder, C.M.G., patented in 1887 a method of chilling the heated surface of a plate by means of jets of water under pressure. By this method it was found possible to obtain a

degree of hardness which was prevented in ordinary plunging by the formation of a layer of steam between the water and the heated surface of the plate. Compound plates face-hardened on this system gave excellent results, and forged-steel armour-piercing projectiles were in some cases broken up on their surfaces as if they had been merely chilled iron. Attempts were also made to increase the toughness of the back by the substitution of mild nickel steel for wrought iron. The inherent defect of compound armour, however—its want of homogeneity,—remained, and in the year 1891 H.A. Harvey of Newark, N.J., introduced a process whereby an all steel plate could be face-hardened in such a way that the advantages of the compound principle were obtained in a homogeneous plate. The process in question consisted in carburizing or cementing the surface of a steel plate by keeping it for a fortnight or so at a high temperature in contact with finely divided charcoal, so that the heated surface absorbed a certain amount of carbon, which penetrated to a considerable depth, thus causing a difference in chemical composition between the front and back of the plate. After it had been left a sufficient time in the cementation furnace, the plate was withdrawn and allowed to cool slowly until it reached a dull red heat, when it was suddenly chilled by the application of water, but by a less perfect method than that employed by Tresidder. Steel plates treated by the Harvey and Tresidder processes, which shortly became combined, possessed about twice the resisting power of wrought iron. The figure of merit, or resistance to penetration as compared with wrought iron, varied with the thickness of the plate, being rather more than 2 with plates from 6 to 8 in. thick and rather less for the thicker plates. In 1889 Schneider introduced the use of nickel in steel for armour plates, and in 1891 or 1892 the St Chamond works employed a nickel steel to which was added a small percentage of chromium.

All modern armour contains nickel in percentages varying from 3 to 5, and from 1.0 to 2.0% of chromium is also employed as a general rule.

Nickel in the above quantities adds greatly to the toughness as well as to the hardness of steel, while chromium enables it to absorb carbon to a greater depth during cementation, and increases its susceptibility to tempering, besides conducing to a tough fibrous condition in the body of a plate. Alloy steels of this nature appear to be very susceptible to thermal treatment, by suitable variation of which, with or without oil quenching, the physical condition of the same steel may be made to vary to an extraordinary extent, a peculiarity which is turned to good account in the manufacture of the modern armour plate.

The principal modern process is that introduced by Krupp in 1893. Although it is stated that a few firms both in Great Britain and in other countries use special processes of their own, it is probable that they differ only in detail from the Krupp process, which has been adopted by the great majority of makers. Krupp plates are made of nickel-chrome steel and undergo a special heat treatment during manufacture which is briefly described below. They can either be cemented or, as was usual in England until about 1902 in the case of the thinner plates (4 in. and under) and those used for curved structures such as casemates, non-cemented. They are in either case face-hardened by chilling. Messrs Krupp have, however, cemented plates of 3 in. and upward since 1895. Although the full process is now applied to plates of as little as 2 in. in thickness, there is some difference of opinion between manufacturers as to the value of cementing these very thin plates. The simple Harvey process is still employed to some extent in the case of plates between 5 and 3 in. in thickness, and excellent results are also stated to have been obtained with plates from 2 to 4 in. in thickness, manufactured from a special steel by the process patented by M. Charpy of the St Jacques steel works at Montluçon. A Krupp cemented (K.C.) plate is not perhaps harder as regards surface than a good Harveyed plate, but the depth of hard face is greater, and the plate is very much tougher in the back, a quality which is of particular importance in the

thicker plates. The figure of merit varies, as in Harveyed plates, with the thickness of the armour, being about 2.7 in the case of good 6-in. plates while for the thicker plates the value gradually falls off to about 2.3 in the case of 12-in. armour. This figure of merit is as against uncapped armour-piercing shot of approximately the same calibre as the thickness of the plate. The resisting power of the non-cemented Krupp plates is usually regarded as being considerably less than that of the cemented plates, and may be taken on an average to be 2.25 times that of wrought iron.

Figs. 3, 4 and 5 are illustrations of good cemented plates of the Krupp type. Fig. 3 shows an 11.8-in. plate, tried by Messrs Krupp in 1895, after attack by three 12-in. steel armour-piercing projectiles of from 712.7 to 716.1 lb in weight. In the third round the striking velocity of the projectile was 1993 ft. per second, the calculated perforation of wrought iron by Tresidder's formula being 25.9 in. The attack was successfully resisted, all the projectiles being broken up without effecting perforation, while there were no serious cracks. The figure of merit of the plate was thus well in excess of 2.2. The great toughness of the plate is perhaps even more remarkable than its hardness; its width was only 6.28 ft., so that each shot head formed a wedge of approximately one-sixth of its width. The excellence of the metal which is capable of withstanding such a strain is apparent.

Fig. 4 is of a 9-in. K.C. plate, made by Messrs Armstrong, Whitworth & Co. for the Japanese government, after undergoing an unusually severe official test. The fourth round was capable of perforating 22 in. of wrought iron, so that the figure of merit of the plate must have been considerably in excess of 2.45, as there were no through-cracks, and the limit of resistance was far from being reached.

Fig. 5 shows the front of an excellent 6-in. cemented plate of Messrs Beardmore's manufacture, tried at Eskmeals on the 11th of October 1901. It

withstood the attack of four armour-piercing 6-in. shot of 100 lb weight, with striking velocities varying from 1996 to 2177 ft. per second. Its limit of resistance was just passed by the fifth round in which the striking velocity was no less than 2261 ft. per second. The projectile, which broke up in passing through the plate, did not get through the skin plate behind the wood backing, and evidently had no surplus energy left. The figure of merit of this plate was between 2.6 and 2.8, but was evidently much closer to the latter than to the former figure. A sixth round fired with a Johnson capped shot weighing 105.9 lb easily perforated both plate and backing with a striking velocity of 1945 ft. per second, thus reducing the figure of merit of the plate to below 2.2 and illustrating very clearly the advantage given by capping the point of an armour-piercing projectile. There were no through-cracks in the plate after this severe trial, the back being evidently as tough as the face was hard.

Fig. 6 shows a 3-in. K.N.C. plate of Messrs Vickers, Sons & Maxim's manufacture, tested privately by the firm in November 1905. It proved to be of unusual excellence, its limit of resistance being just reached by a 12½-lb armour-piercing shell of 3 in. calibre with a striking velocity of 2558 ft. per second, a result which, even if the projectiles used were not relatively of the same perforating power as those used in the proof of 6-in. and thicker plates, shows that its resisting power was very great. At a low estimate its figure of merit against 3-in. A.P. *shot* may be taken as about 2.6, which is exceptionally high for a non-cemented, or indeed for any but the best K.C. plates.

The plate also withstood the attack of a 4.7-in. service pattern steel armour-piercing shell of 45 lb weight striking the unbacked portion with a velocity of 1599 ft. per second, and was only just beaten by a similar shell with a velocity of 1630 ft. per second. The effect of all the above-mentioned rounds is shown in the photograph. The same plate subsequently kept out

two 6-in. common shell filled up to weight with salt and plugged, with striking velocities of 1412 and 1739 ft. per second respectively, the former being against the unbacked and the latter against the backed half of the plate,—the only effect on the plate being that round 6 caused a fragment of the right-hand top corner of the plate to break off, and round 7 started a few surface cracks between the points of impact of rounds 1, 2 and 3.

Within the limitations referred to below, the resisting power of all hard-faced plates is very much reduced when the armour-piercing projectiles used in the attack are capped, the average figure of merit of Krupp cemented plates not being more than 2 against capped shot as compared with about 2.5 against uncapped. So long ago as 1878 it was suggested by Lt.-Col. (then Captain) T. English, R.E., that armour-piercing projectiles would be assisted in attacking compound plates if caps of wrought iron could be fitted to their points. Experiments at Shoeburyness, however, did not show that any advantage was gained by this device, and nothing further was heard of the cap until 1894, when experiments carried out in Russia with so-called “magnetic” shot against plates of Harveyed steel showed that the perforating power of an armour-piercing projectile was considerably augmented where hard-faced plates were concerned, if its point were protected by a cap of wrought iron or mild steel. The conditions of the Russian results (and of subsequent trials in various parts of the world which have confirmed them) differed considerably from the earlier English ones. The material of both projectiles and plates differed, as did also the velocities employed—the low velocities in the earlier trials probably contributing in large measure to the non-success of the cap. The cap, as now used, consists of a thimble of comparatively soft steel of from 3 to 5% of the weight of the projectile, attached to the point of the latter either by solder or by being pressed hydraulically or otherwise into grooves or indentations in the head. Its function appears to be to support the point on impact, and so to enable it to get unbroken through the hard face layers of

the plate. Once through the cemented portion with its point intact, a projectile which is strong enough to remain undeformed, will usually perforate the plate by a true boring action if its striking velocity be high enough. In the case of the uncapped projectile, on the other hand, the point is almost invariably crushed against the hard face and driven back as a wedge into the body of the projectile, which is thus set up so that, instead of boring, it acts as a punch and dislodges or tends to dislodge a coned plug or disk of metal, the greatest diameter of which may be as much as four times the calibre of the projectile. The disproportion between the maximum diameter of the disk and that of the projectile is particularly marked when the calibre of the latter is much in excess of the thickness of the plate. When plate and projectile are equally matched, *e.g.* 6″ versus 6″, the plug of metal dislodged may be roughly cylindrical in shape, and its diameter not greatly in excess of that of the projectile. In all cases the greatest width of the plug or disk is at the back of the plate.

A stout and rigid backing evidently assists a plate very much more against this class of attack than against the perforating attack of a capped shot. Fig. 7 shows the back of a 6-in. plate attacked in 1898, and affords an excellent illustration of the difference in action of capped and uncapped projectiles. In round 7 the star-shaped opening made by the point of a capped shot boring its way through is seen, while rounds 2, 3, 4 and 5 show disks of plate partially dislodged by uncapped projectiles. The perforating action of capped armour-piercing projectiles is even better shown in fig. 8, which shows a 250-mm. (9.8 in.) Krupp plate after attack by 150-mm. (5.9 in.) capped A.P. shot. In rounds 5 and 6 the projectiles, with striking velocities of 2302 and 2281 ft. per second, perforated. Round 7, with a striking velocity of 2244 ft. per second, just got its point through and rebounded, while round 8, with a striking velocity of 2232, lodged in the plate. In many cases a capped projectile punches out a plug, usually more or less cylindrical in shape and of about the same diameter as the projectile,

from a plate, and does not defeat it by a true boring action. In such cases it will probably be found that the projectile has been broken up, and that only the head, set up and in a more or less crushed condition, has got through the plate. This peculiarity of action can best be accounted for by attributing either abnormal excellence to the plate or to that portion of it concerned—for plates sometimes vary considerably and are not of uniform hardness throughout,—or comparative inferiority to the projectile. Whichever way it may be, what has happened appears to be that after the cap has given the point sufficient support to get it through the very hard surface layers, the point has been flattened in the region of extreme hardness and toughness combined, which exists immediately behind the deeply carburized surface. The action from this point becomes a punching one, and the extra strain tends to break up the projectile, so that the latter gets through wholly or partially, in a broken condition, driving a plug of plate in front of it. At low striking velocities, probably in the neighbourhood of 1700 ft. per second, the cap fails to act, and no advantage is given by it to the shot. This is probably because the velocity is sufficiently low to give the cap time to expand and so fail to grip the point as the latter is forced into it. The cap also fails as a rule to benefit the projectile when the angle of incidence is more than 30° to the normal.

PLATE I.

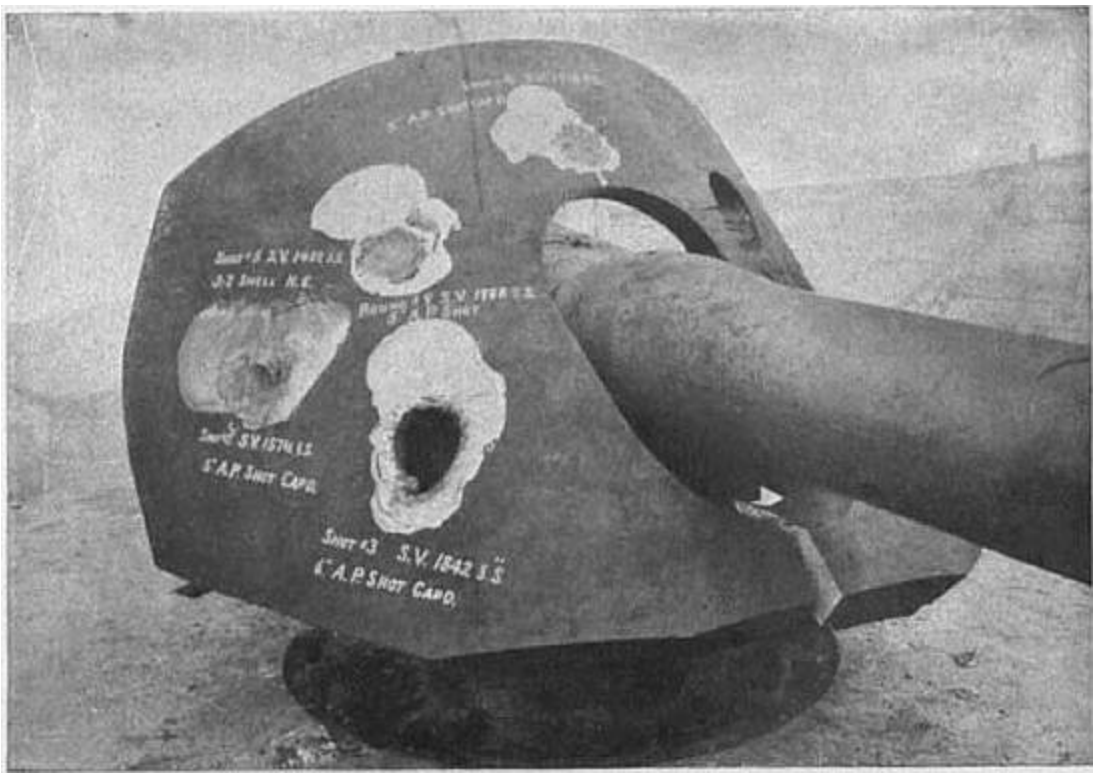


FIG. 1.—HARVEYIZED SHIELD, 4.5 INCHES THICK, ON 6-INCH PEDESTAL MOUNT, AFTER ATTACK BY 5-INCH AND 6-INCH CAPPED ARMOUR-PIERCING SHOT.

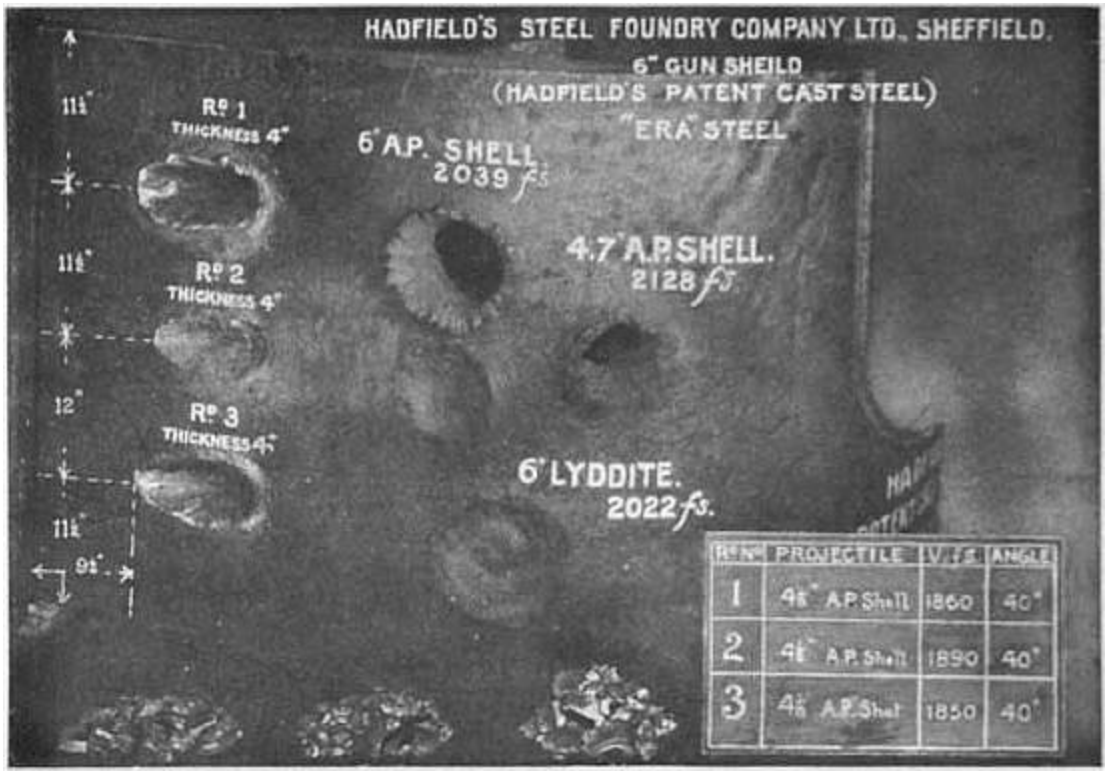


FIG. 2.—GUN SHIELD, 6 INCHES THICK, AFTER ATTACK.
(HADFIELD.)

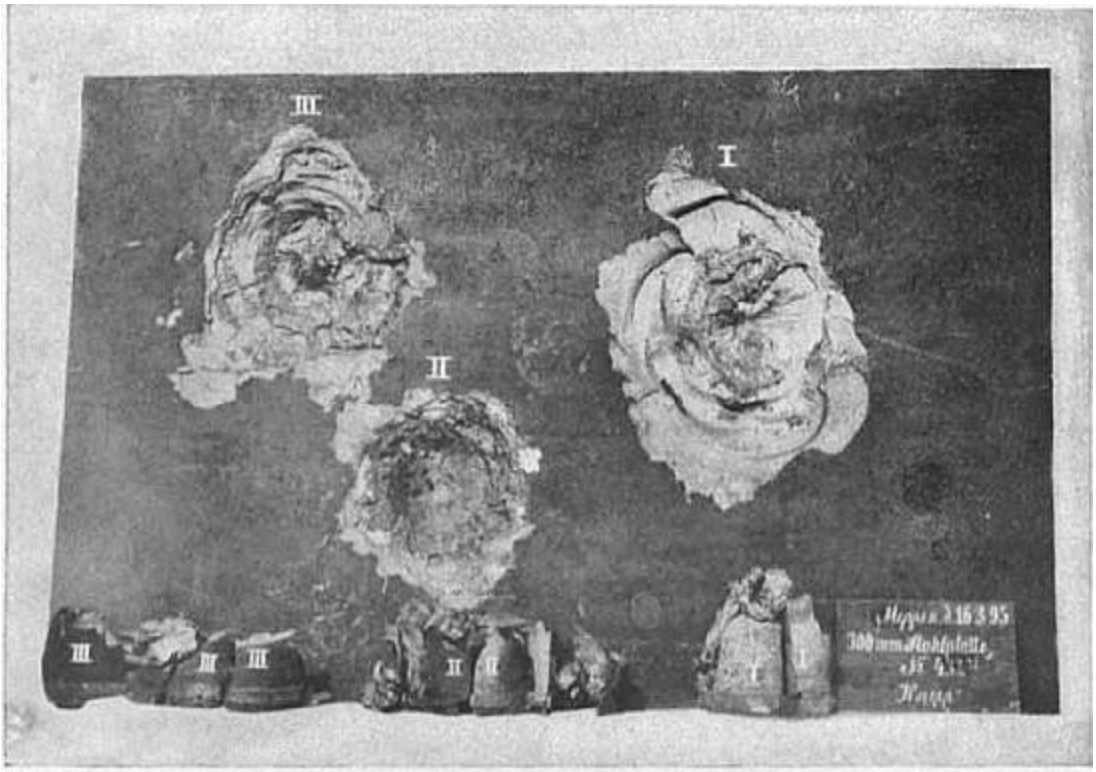


FIG. 3.—KRUPP-CEMENTED PLATE, 11.8 INCHES THICK, AFTER ATTACK.
(KRUPP, MEPPEN.)

FIG. 4.—KRUPP-CEMENTED PLATE, 9 INCHES THICK, AFTER ATTACK.
(ARMSTRONG, WHITWORTH & CO.)]

PLATE II.

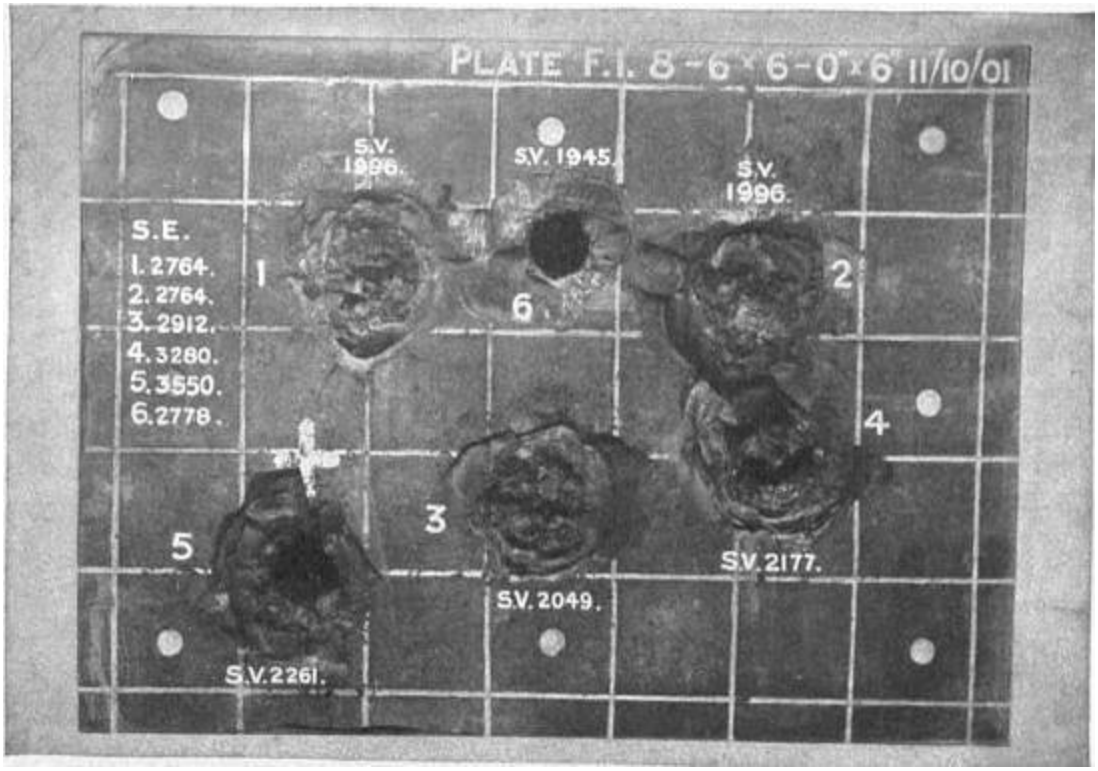


FIG. 5.—BEARDMORE CEMENTED PLATE, 6-INCHES THICK, AFTER ATTACK BY 6-INCH SHOT.

(From Brassey's Naval Annual, 1902 by permission.)

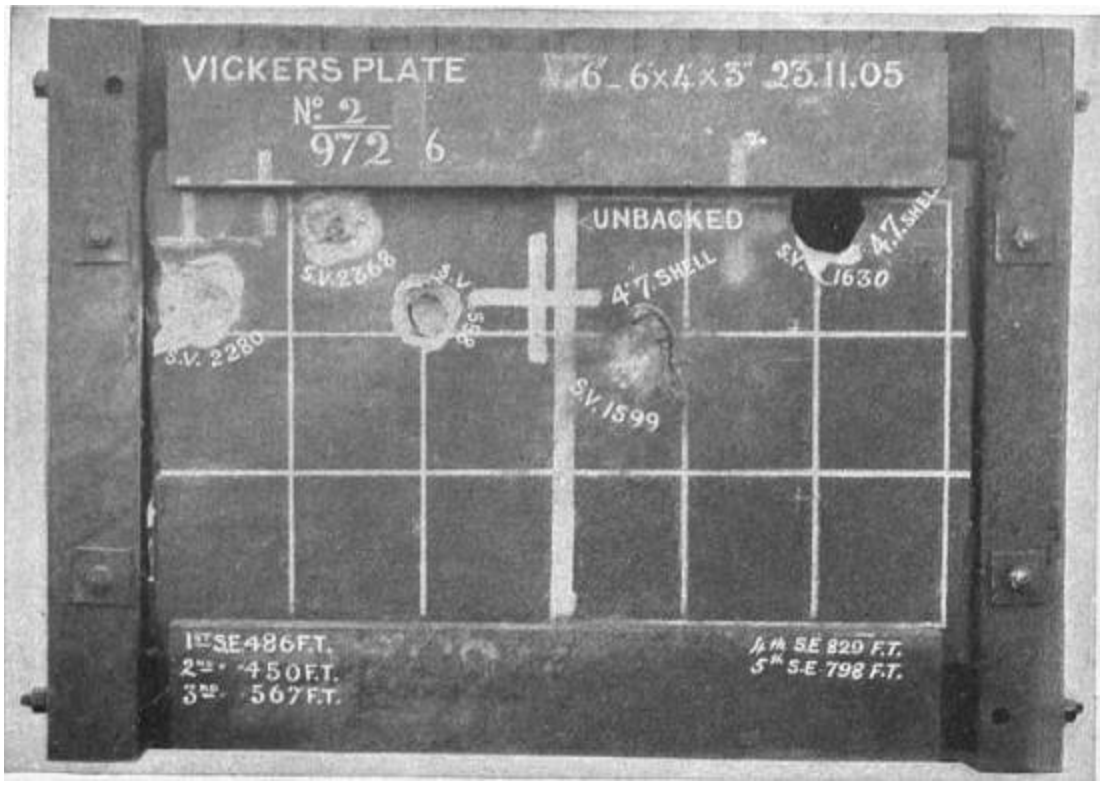


FIG. 6.—KRUPP-CEMENTED PLATE, 3 INCHES THICK, AFTER ATTACK.
(VICKERS, SONS & MAXIM.)

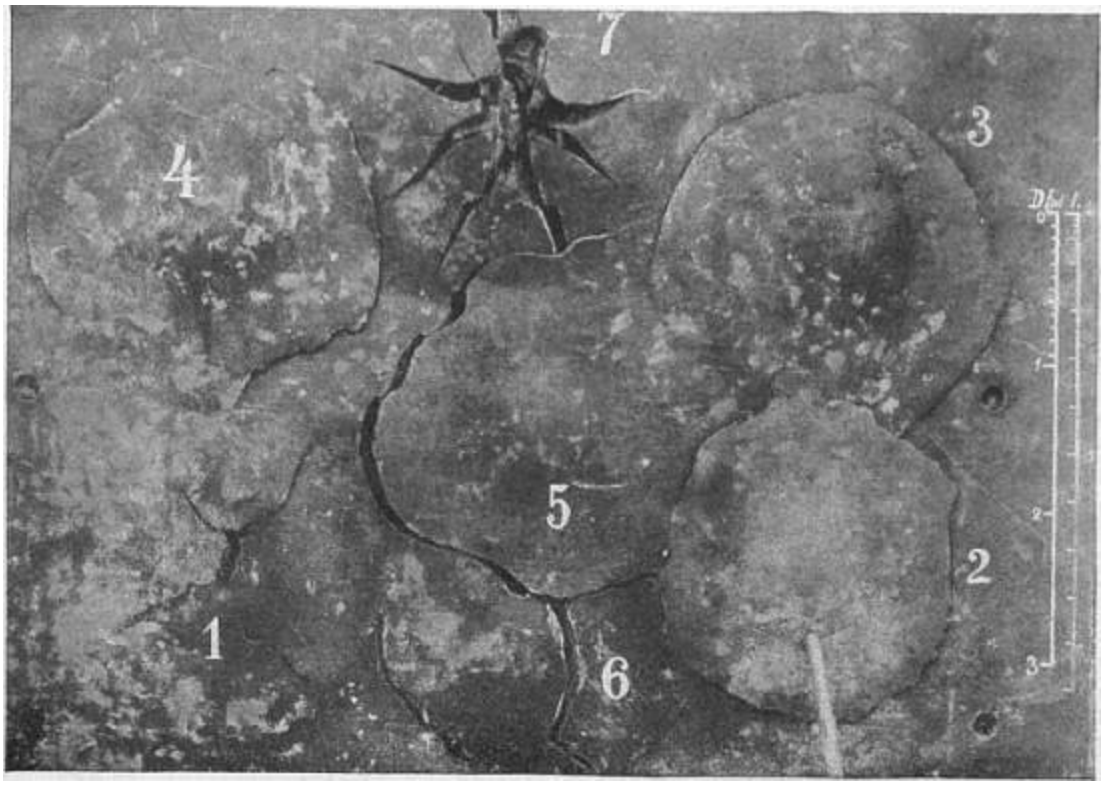


FIG. 7.—BACK OF A 6-INCH PLATE SHOWING ACTION OF CAPPED AND UNCAPPED PROJECTILES.

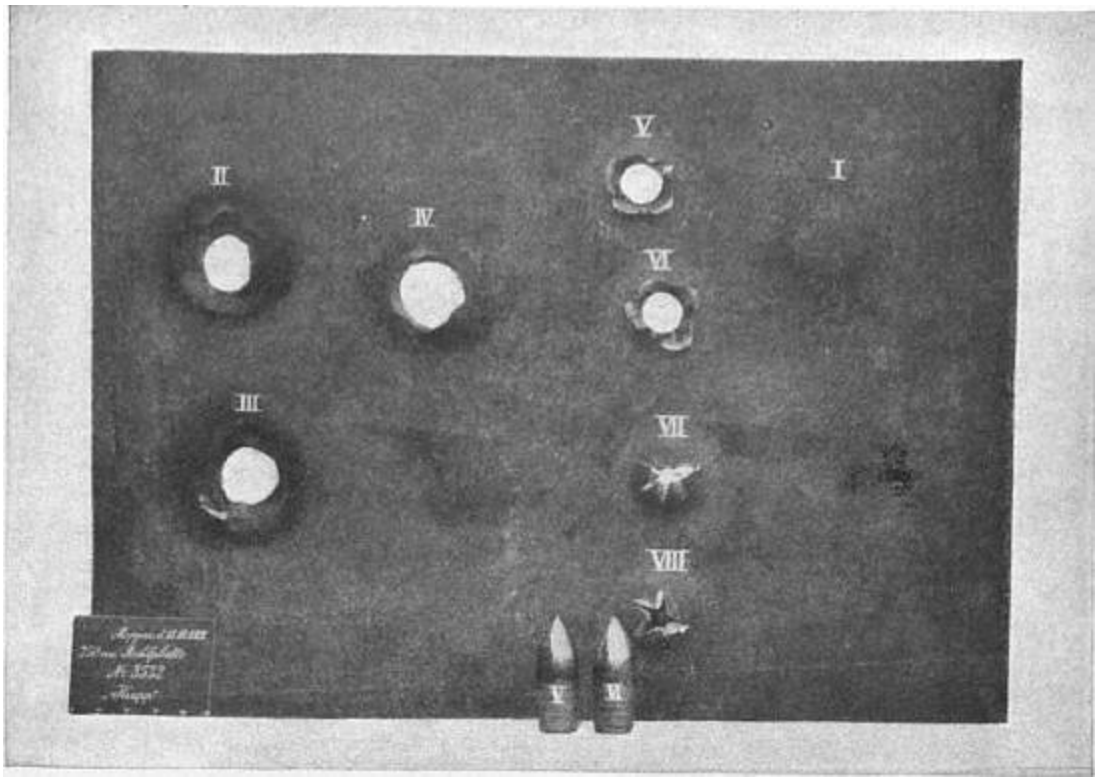


FIG. 8.—BACK OF KRUPP PLATE 9.8 INCHES THICK, AFTER ATTACK, WITH CAPPED PROJECTILE. (KRUPP, MEPPEN.)

(From Brassey's Naval Annual, by permission.)

Laws of Resistance.

The laws governing the resistance of armour to perforation have been the subject of investigation for many years, and a considerable number of formulae have been put by means of which the thickness of armour perforable by any given projectile at any given striking velocity may be calculated. Although in some cases based on very different theoretical considerations, there is a general agreement among them as far as perforation proper is concerned, and Tresidder's formula for the perforation of wrought iron, $t^2 = wv^3/dA$, may be taken as typical. Here t represents the thickness perforable in inches, w the weight of the projectile in pounds, v its velocity in foot seconds, d its diameter in inches and A the constant given by $\log A = 8.8410$.

For the perforation of Harveyed or Krupp cemented armour by capped armour-piercing shot, this formula may be employed in conjunction with a suitable constant according to the nature of armour attacked. In the case of K. C. armour the formula becomes $t^2 = wv^3/4dA$. A useful rough rule is $t/d = v/1900$.

Hard armour, such as chilled cast iron, cannot be perforated but must be destroyed by fracture, and its destruction is apparently dependent solely upon the striking energy of the projectile and independent of its diameter. The punching of hard-faced armour by uncapped projectiles is intermediate in character between perforation and cracking, but approaches the former more nearly than the latter. The formula most used in England in this case is Krupp's formula for K.C., viz. $t^2 = wv^2/dA_1$, where t, w, v and d are the same as before, and $\log A_1 = 6.3532$. This, if we assume the sectional density (w/d^3) of projectiles to be constant and equal to 0.46, reduces to the very handy rule of thumb $t/d = v/2200$, which, within the limits of striking velocity obtainable under service conditions, is sufficiently accurate for practical purposes. For oblique attack up to an angle of 30° to the normal, the same formula may be employed, $t \sec \theta$ being substituted for t, where θ is the angle of incidence and t the normal thickness of the plate attacked. More exact results would be obtained, however, by the use of Tresidder's W.I. formula, given above, in conjunction with a suitable figure of merit, according to the nature and thickness of the plate. It should be remembered in this connexion that the figure of merit of a plate against a punching attack falls off very much when the thickness of the plate is considerably less than the calibre of the attacking projectile. For example, the F.M. of a 6-in. plate may be 2.6 against 6-in. uncapped A.P. projectiles, but only 2.2 against 9.2-in. projectiles of the same character. In the case of the perforating action of capped projectiles, on the other hand, the ratio of d and t does not appear to affect the F.M. to any great extent, though according to

Tresidder, the latter is inclined to fall when d is considerably less than t, which is the exact opposite of what happens with punching.

Another method of measuring the quality of armour, which is largely employed upon the continent of Europe, is by the ratio, r, between the velocity requisite to perforate any given plate and that needed to pierce a plate of mild steel of the same thickness, according to the formula of Commandant Jacob de Marre, viz. $v = Ae^{0.7} \cdot a^{0.75}/p^{0.5}$ where e = the thickness of the plate in centimetres, a = the calibre of the projectile in centimetres, p = the weight of the projectile in kilogrammes, v = the striking velocity of the projectile in metres per second, and log A = 1.7347. Converted into the usual English units and notation, this formula becomes $v = A_1 t^{0.7} \cdot d^{0.75}/w^{0.5}$, in which $\log A_1 = 3.0094$; in this form it constitutes the basis of the ballistic tests for the acceptance of armour plates for the U.S. navy.

Common shell, which are not strong enough to remain undeformed on impact, derive little benefit from the cap and usually defeat a plate by punching rather than by perforation. Their punching power may be taken roughly as about ⅔ that of an uncapped armour-piercing shot. Shells filled with high explosives, unless special arrangements are made to deaden the bursting charge and so obviate detonation upon impact, are only effective against the thinnest armour.

Manufacture.

With regard to manufacture, a brief account of the Krupp process as applied in one of the great English armour plate works (omitting confidential details of temperature, &c.) will illustrate the great complexity of treatment which the modern armour plate has to undergo before its remarkable qualities of combined hardness and toughness can be developed. The composition of the steel probably differs slightly with the manufacturer, and

also with the thickness of the armour, but it will usually contain from 3 to 4% of nickel, from 1.0 to 2.0% of chromium and about 0.25 to 0.35% of carbon, together with from 0.3 to 0.7% of manganese. After being cast, the ingot is first heated to a uniform degree of temperature throughout its mass and then generally forged under the hydraulic forging press. It is then reheated and passed through the rolls. After rolling, the plate is allowed to cool, and is then subjected to a thermal treatment preparatory to surfacing and cutting. Its surface is then freed from scale and planed. After planing, the plate is passed into the cementation furnace, where its face remains for some weeks in contact with specially prepared carbon, the temperature being gradually raised to that required for cementation and as gradually lowered after that is effected. After cementation the plate is heated to a certain temperature and is then plunged into an oil bath in order to toughen it. After withdrawal from the oil bath, the plate is cooled, reheated to a lower temperature, quenched again in water, reheated and passed to the bending press, where it is bent to shape while hot, proper allowance being made for the slight change of curve which takes place on the final chilling. After bending it is again heated and then allowed to get cold, when the final machining, drilling and cutting are carried out. The plate is now placed in a furnace and differentially heated so that the face is raised to a higher temperature than the back. After being thus heated for a certain period the plate is withdrawn, and both back and face are douched simultaneously with jets of cold water under pressure, the result being that the face is left glass-hard while the back is in the toughest condition possible for such hard steel.

The cast-steel armour made by Hadfield has already been alluded to. That made by Krupp (the only other maker at present of this class of armour) is of face-hardened nickel steel. A 5.9-in. plate of this material tried in 1902 had a figure of merit of more than 2.2 against uncapped 5.9-in. armour-piercing projectiles of 112 lb in weight. The main advantage of cast armour

is that it is well adapted to armoured structures of complicated design and of varying thickness, which it would be difficult or impossible to forge in one piece. It should also be cheaper than forged armour, and, should time be a consideration, could probably be turned out more quickly; on the other hand, it is improbable that heavy castings such as would be required could be as regular in quality and as free from flaws as is possible when forged material is used, and it is unlikely that the average resistance to attack of cast-steel armour will ever be equal to that of the best forged steel.

Defence against small-arms.

Of recent years there has been a considerable demand for thin steel plating proof against small-arm bullets at close ranges. This class of steel is used for field-gun shields and for sap shields, to afford cover for men in field-works, for armoured trains, motor-cars and ambulances, and also very largely for armouring shallow-draught river-gunboats. Holtzer made chrome steel breastplates in 1890, 0.158 in. of which was proof against the 0.43-in. hard lead bullet of the Gras rifle at 10 metres range, while 0.236 in. was proof against the 0.32 in. 231-grain Lebel bullet at the same distance, the striking velocities being approximately 1490 and 2070 ft. per second respectively. The bullet-proof steel made by Messrs Cammell, Laird & Co. in Great Britain may be taken as typical of that produced by the best modern manufacturers. It is proof against the 215-grain Lee-Enfield bullet of 0.303 in. calibre striking directly, as under:

Range.	Thickness of Plate.	Striking Velocity.
10 yards	0.187 inch	2050 f.s.
100 ”	0.167 ”	1865 ”
560 ”	0.080 ”	1080 ”

The weight of the 0.08 in. plating is only 3.2 lb per sq. ft. The material is stated to be readily adaptable to the ordinary operation of bending,

machining, drilling, &c., and is thus very suitable for the purposes indicated above.

(W. E. E.)

ARMS AND ARMOUR (Lat. *arma*, from the Aryan root *ar*, to join or fit; cf. Gr. ἁρμός, joint; the form *armour*, from Lat. *armatura*, should strictly be *armure*). Under this heading are included weapons of offence (arms) and defensive equipment (armour). The history of the development of arms and armour begins with that of the human race; indeed, combined with domestic implements, the most primitive weapons which have been found constitute the most important, if not the only, tangible evidence on which the history of primitive man is based. It is largely from the materials and characteristics of the weapons and utensils found in caves, tombs and various strata of the earth's crust, coupled with geological considerations, that the ethnological and chronological classifications of prehistoric man have been deduced. For a detailed account of this classification and the evidence see ARCHAEOLOGY; BRONZE AGE; FLINT IMPLEMENTS, &c., and articles on special weapons.

Classification.

Offensive weapons may be classified roughly, according to their shape (*i.e.* the kind of blow or wound which they are intended to inflict), and the way in which they are used, as follows:—(1) Arms which are wielded by hand at close quarters. These are subdivided into (*a*) *cleaving* weapons, *e.g.* axes; (*b*) *crushing*, *e.g.* clubs, maces and all hammer-like arms; (*c*) *thrusting*, *e.g.* pointed swords and daggers; (*d*) *cutting*, *e.g.* sabres (such weapons

frequently combine both the cut and the thrust, *e.g.* swords with both edge and point); (*e*) those weapons represented by the spear, lance, pike, &c., which deal a thrusting blow but are distinguished from (*c*) by their greater length. (2) Purely missile weapons, *e.g.* darts, javelins and spears. Frequently these weapons are used also at close quarters as thrusting weapons; the typical example of these is the medium-length spear of not more than about 6 ft. in length. (3) Arms which discharge missiles, *e.g.* bows, catapults and fire-arms generally. (See ARCHERY and section *Fire-arms* below.) The weapons in (2) and (3) are designed to avoid hand-to-hand fighting.

Weapons are also classified in a variety of other ways. Thus we have *small-arms*, *i.e.* all weapons in classes (1) and (2) with those in (3) which do not require carriages. *Side-arms* are those which, when not in use, are worn at the side, *e.g.* daggers, swords, bayonets. *Armes blanches* is a term used for offensive weapons of iron and steel which are used at close quarters.

Defensive armour consists of body armour, protections for the head and the limbs, and various types of shield.

History.

1. *Stone Age.*—One of the chief problems which have perplexed archaeologists is that of finding a criterion which will enable them to distinguish the most primitive products of human skill from similar objects whose form is due to the forces of nature. It is often impossible to say precisely whether a rough piece of flint is to be regarded as a weapon (except so far as it could be used as a missile) or merely as a fragment of rock. Passing over these doubtful cases, we come first to indubitable examples of weapons deliberately fashioned in stone for

FIG. 1.—Leaf-shaped Flint Dagger.

offensive purposes. The use of stone weapons appears to have been universally characteristic of the earliest races of mankind, as it is still distinctive of those savage races which are most nearly allied to primitive man. These weapons were naturally simple in form and structure. The earliest examples (Palaeolithic) found in river-drift gravel in various parts of Europe are merely chipped flints, celts, &c. Later on we find polished implements (Neolithic) progressively more elaborate in design and workmanship, such as socketed stones with wooden handles and knives or daggers of flaked flint with handles. Besides flint the commonest materials are diorite, greenstone, serpentine and indurated clay-slate; there are also weapons of horn and bone (daggers and spear-heads). Spear-heads and arrow-points (leaf-shaped, lozenge-shaped, tanged and triangular) were chipped in flint with such skill as to be little inferior to their metal successors. They have accurately flaked barbs and tangs, and in some cases their edges are minutely chipped. The heads appear to have been fastened to the shafts by vegetable fibre and bitumen. Knife-daggers of flint, though practically of one single type, exhibit much variety of form. They vary in size also, but seldom exceed 12 in. in length. They are sometimes obtuse-edged like a scraping-tool, sometimes delicately chipped to a straight edge, while the flakes are so regularly removed from the convex part of the blade as to give a wavy surface, and the corners of the handle are delicately crimped. The daggers attain their highest perfection in the short, leaf-shaped form,—the precursor of the leaf-shaped sword which is peculiarly characteristic of the Bronze Age,—and the curved knives found especially in Great Britain and Russia, and also in Egypt. The precise object of the sharpening of both convex and concave edges in the curved variety is not clear. There have also been found sling-stones, and, in Scotland and Ireland, balls of stone with their “surfaces divided into a number of more or less projecting circles with channels between them.” These latter, Sir John Evans suggests, were attached to a thong which passed through the surface

channels, and used like the *bolas* of South America. The weapon could thus deal a blow at close quarters, or could be thrown so as to entangle the limbs of an enemy. Of defensive armour of stone there is none. The only approximation is to be found in the small rectangular plates of slate, &c., perforated with holes at the corners, which are supposed to have been bound on to the arm to protect it from the recoil of the bow-string. Similar wristlets or bracers are in use among the Eskimos (of bone) and in India (of ivory). These plates measure generally about 4 in. by 1½ in.

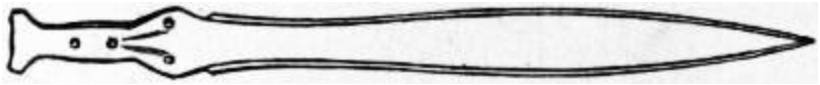


FIG. 2.—Leaf-shaped Bronze Sword.

2. *Bronze Age.*—It is impossible to assign any date as the beginning of the Bronze Age; indeed, archaeology has shown that the adoption of metal for weapons was very gradual. The stone weapon perseveres alongside the bronze, and there exist stone axes which, by their shape, suggest that they have been copied from metal axes. In the earliest interments in which the weapons deposited with the dead are of other materials than stone, a peculiar form of bronze dagger occurs. It consists of a well-finished, thin, knife-like blade, usually about 6 in. in length, broad at the hilt and tapering to the point, and attached to the handle by massive rivets of bronze. It has been found associated with stone celts; both of the roughly chipped and the highly polished kind, showing that these had not been entirely disused when bronze became available. A later type of bronze dagger is a broad, heavy, curved weapon, usually from 9 to 15 in. in length, with massive rivets for attachment to an equally massive handle. The leaf-shaped sword, however, is the characteristic weapon of the Bronze Age. It is found all over Europe, from Lapland to the Mediterranean. No warlike weapon of any period is more graceful in form or more beautifully finished. The finish seems to

have been given in the mould without the aid of hammer or file, the edge being formed by suddenly reducing the thickness of the metal, so as to produce a narrow border of extreme thinness along both sides of the blade from hilt to point. The handle-plate and blade were cast in one piece, and the handle itself was formed by side plates of bone, horn or wood, riveted through the handle-plates. There was no guard, and the weapon, though short, was well balanced, but more fitted for stabbing and thrusting than for cutting with the edge. The Scandinavian variety is not so decidedly leaf-shaped, and is longer and heavier than the common British form; and instead of a handle-plate, it was furnished with a tang on which a round, flat-topped handle was fastened, like that of the modern Highland dirk, sometimes surmounted by a crescent-like ornament of bronze. A narrow, rapier-shaped variety, tapering from hilt to point, was made without a handle-plate, and attached to the hilt by rivets like the bronze daggers already mentioned. This form is more common in the British Isles than in Scandinavia, and is most abundant in Ireland. The spear-heads of the Bronze Age present a considerable variety of form, though the leaf-shaped predominates, and barbed examples are extremely rare. Some British weapons of this form occasionally reach a length of 27 in. The larger varieties are often beautifully designed, having segmental openings on both sides of the central ridge of the blade, and elaborately ornamented with chevron patterns of chased or inlaid work both on the socket and blade. Arrow-points are much rarer in bronze than in flint. In all probability the flint arrow-point (which was equally effective and much more easily replaced when lost) continued to be used throughout the Bronze Age. Shields of bronze, circular, with hammered-up bosses, concentric ridges and rows of studs, were held in the hand by a central handle underneath the boss. The transition period between the Bronze and Iron Ages in central Europe is well defined by the occurrence of iron swords, which are simple copies of the leaf-shaped weapon, sometimes with flat handle-plate of

bronze. These have been found associated with articles assigned to the 3rd or 4th century B.C.

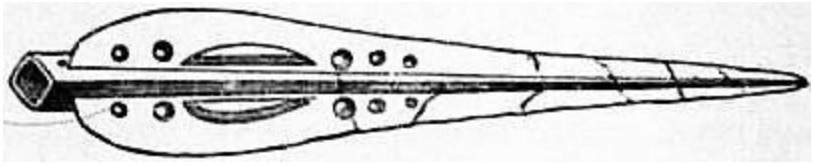


FIG. 3.—Bronze Spear-Head, length 19 inches.

Hallstatt Weapons.

An important distinction between the characteristic bronze swords peculiar to southern peoples and the swords both of iron and of bronze found together in the Hallstatt cemeteries (in the Salzkammergut, Austria, ancient Noricum) is that whereas the former invariably have short handles (2¼ to 2½ in.), the latter are provided with handles from 3 to 3½ in. long, terminating in a round or oval pommel; the grip of one of the bronze swords even reaches a length of 4 in. The hilts are decorated with ivory, amber, wood, bronze, horn, and the decoration of blade and scabbard is often elaborate. The length of these swords is sometimes as much as 30 to 33 in. Again at La Tène on Lake Neuchâtel iron swords have been found to the number of one hundred, with handles of 4 to 7½ in. long and a total length varying from 30 to 38 in. Similar remains have been found in France at Bibracte and Alesia, and even in Ireland (cf. Munro, *The Lake-dwellings of Europe*, pp. 282, 383).

The occurrence at Hallstatt of bronze swords together with iron, having the characteristic long handle, has led to the hypothesis that the graves are those of an immigrant (probably Celtic) people of northern extraction which had conquered and overlaid a smaller-framed Bronze Age people, and had introduced the use of iron while continuing to use the bronze of their predecessors with the necessary modifications. This theory derived from

tangible remains is corroborated by literary evidence. Thus Polybius (ii. 33, iii. 114) describes the Celtic peoples as fighting with a long pointless iron sword, which easily bent and was in any case too large to be used easily in a mêlée.

The graves at Hallstatt yielded in addition to these important swords a much larger number of spears. Of these two only were of bronze, the head of the larger being 7½ in. long. The much more numerous iron heads range up to as much as 2 ft. in length, and are all fastened to the shaft by rivets. All the arrow-heads found are of bronze, while of the axes the great majority are of iron; a few have iron edges fitted in a bed of bronze.

These examples are sufficient to show that the transition from bronze to iron was very slow. The fact that they were found in a district which is known to have been directly in the line of march pursued by invaders from the north tends to confirm the theory that the introduction of iron was the work of such invaders.

See Sir John Evans, *Ancient Stone Implements* (2nd. ed., 1897), *Bronze Implements*; W. Ridgeway, *Early Age of Greece*; and works quoted under ARCHAEOLOGY.

3. *Early Greek Weapons.*—The character of the weapons used by the early peoples of the Aegean in the periods known as Minoan, Mycenaean and Homeric is a problem which has given rise of recent years to much discussion. The controversy is an important part of the Homeric question as a whole, and the various theories of the weapons used in the Trojan War hinge on wider theories as to the date and authorship of the Homeric poems. One widely accepted hypothesis, based on the important monograph by Dr Wolfgang Reichel, *Über homerische Waffen. Archäologische Untersuchungen* (Vienna, 1894), is that the Homeric heroes, like those who

Mycenaean and Homeric.

created the civilization known as Mycenaean, had no defensive armour except the Mycenaean shield, and used weapons of bronze. This view is derived to a great extent from the Homeric poems themselves, in which the metal most frequently mentioned is χαλκός (bronze), and involves the assumption that all passages which describe the use of corslets, breastplates, small shields and greaves are later interpolations. It is maintained on the other hand (*e.g.* by Prof. W. Ridgeway, *Early Age of Greece*, i. chap. 3), that the Homeric Achaeans (whom he regards as the descendants of the central European peoples, the makers of the Hallstatt iron swords) were far advanced into the Iron Age, and that the use of bronze weapons is merely another instance of the fact that the introduction of a new element does not necessarily banish the older. This theory would separate the Homeric from the Mycenaean altogether, and is part of a much more comprehensive ethnological hypothesis. According to another hypothesis, the Homeric poems are true descriptions of a single age, or, in other words, the weapons of the Homeric age were far more diverse and elaborate than is supposed by Reichel.

Very few traces of iron have been found in the Mycenaean settlements, nor have any examples of body armour been found except the ceremonial gold breastplates at Mycenae. The Mycenaean soldiers carried apparently a bronze spear, a bronze sword and a bow and arrows. The arrow-heads are first of obsidian and later of bronze. It would appear that only the chief warriors used spear and shield, while the majority fought with bows. The swords found at Mycenae are two-edged, of rigid bronze, and as long as 3 ft. or even more; from representations of battles it would seem that they were perhaps used for thrusting mainly. They are highly ornamented and some have hilts of wood, bone or ivory, or even gold mounting. Later swords became shorter and of a type like that of early iron swords found in Greece. Moreover in a few cases there have been found in pre-Mycenaean (late Minoan III.) tombs a few examples of short iron swords together with

bronze remains. All Mycenaean spears are of bronze and, apparently, their shafts, unlike the Homeric, had no butt-piece. In the absence of any metal helmets in the tombs we may perhaps assume that the Mycenaean helmet was a leather cap, possibly strengthened with tusks, such as appears in Homer (*Iliad*, x.) also. The Mycenaean shield (generally, perhaps, made of leather) has given rise to much controversy, which hinges largely on the interpretation of the evidence provided by the representation on the Warrior Vase and the Painted Stele from Mycenae and pottery found at Tiryns. Professor Ridgeway regards these as describing post-Mycenaean conditions, and maintains that the true Mycenaean shield was always long (from neck to feet), and that it was either in the form of a figure-of-eight targe, or rectangular and sometimes incurved like the section of a cylinder; whereas the Homeric shield was round (*e.g.* κυκλότερος, εὔκυκλος, &c.). Dr Reichel's followers believe that the Homeric shield was long ("like a tower") and incurved in the centre like the Mycenaean, that Homer knew nothing of the small round shield, and that the epithets implying roundness used in the poems are to be explained as meaning "well-balanced" or as late interpolations. On the whole we must conclude that the Mycenaean age is by no means a single homogeneous whole (see AEGEAN CIVILIZATION), and that the weapons are not exclusively of bronze, nor of any single type.

The Homeric warrior in full armour, according to the Homeric poems, wore: (1) shield (ἀσπίς, σάκος), (2) greaves (κνημῖδες), (3) band (ζῶμα), (4) belt (ζωστήρ)and *mitrē*, (5) tunic (χιτών), (6) helmet (κορύς), (7) breastplate (θώρηξ), (8) sword (ξίφος). The λαισήϊον was a protection worn by the archers in place of a shield. According to the usual view, the Homeric shield was, as we have seen, bent in about half way up each side (in the form of a figure-of-eight) to give freedom to the arms, and large enough to protect the whole body. The two curves were held rigid by two Wooden (probably) staves inside. It was composed of layers of ox-hide overlaid with bronze, forming a boss in the centre, and sometimes had studs

upon it. Reichel's view is that it was the weight of these huge shields which led to the use of the chariot as a means of going rapidly from one part of the field to another (though Professor Ridgeway and others contest this, and Helbig mentions more than one case of long journeys on foot under shield), and further that the round shield is entirely unknown to Homer. This large shield was clearly the natural protection against showers of missiles, rather than against enemies fighting with the sword.

The greaves were, no doubt, generally of hide, protected the leg all round, and were fastened at the knee with cords. On the other hand Mycenaean bronze greaves have been found at Enkomi (Cyprus) and at Glassinatz (Glasinac), and therefore it is not necessary, following Reichel, to cut out Homer's references to the "bronze-greaved" Achaeans (*Iliad*, vii. 41), a phrase which has been taken as evidence for regarding the passage as spurious. The tin greaves of Achilles are obviously exceptional.

The *thorex* again is the subject of controversy. Reichel, arguing that the great shield rendered any breastplate unnecessary, regarded the word as a general term for body clothing, but Ridgeway strongly maintains the older theory that it was a bronze breastplate, and Andrew Lang points out that, on Reichel's theory, a word which originally meant the "breast" was transferred to mean "loin-cloth" (which, to judge from the artistic representations, was all that the Mycenaean warrior wore), and subsequently in historic times returned to its natural use for the breastplate —a most unlikely evolution. The passages in Homer which describe it as a breastplate are regarded by Reichel's school as later interpolations. Gilbert Murray thinks that the Homeric poems must be regarded as belonging to different periods of development, and therefore attributes the more elaborate armour to the "surface" (late Ionian) stratum. The *zoma* was probably a loin-cloth, and the *mitrē* a metal band about a foot wide in front and narrow behind to protect the lower part of the body. As a matter of fact,

however, the big shield does not exclude the use of body armour, and it is quite likely that the Homeric warrior wore a bronze corslet, *i.e.* a somewhat improved form of the λινοθώρηξ, or stiffened shirt. On the other hand, it is probable, as we gather from the poems, that this corslet was not strong enough to do more than stop a spent spear. The *chiton* was worn over the *mitrē*, and reached the knees; it was held to the body by the *zostēr*, a metal-plated belt. Helmets were both of metal on leather, and of leather throughout; the crests were of horsehair (not of metal like the later Greek helmets) and there were no cheek-pieces.

The sword has already been mentioned. Ridgeway, in spite of the almost invariable mention of bronze as the material of the Homeric weapons, believes that it was generally of iron, but, while the presence of iron in the Homeric age is admitted in the case of implements, it is generally held that weapons were all of bronze. Except for one arrow-head (*Iliad*, iv. 123), and the mace of Areithoüs, mentioned as a unique example by Nestor (*Iliad*, vii. 141), no reference to an iron weapon proper occurs in the Homeric poems. But the sword was used only when the favourite spear or javelin had failed to decide the contest.

It must be admitted that the problem of pre-Homeric armour and Homeric armour must always be largely a matter of inference, based on a comparative study of the evidence literary and archaeological. Unless we are prepared to adopt the theory that the Homeric poems consist of a mosaic of interpolation informed by an archaizing editor, we must assume that they describe a single period of transition intermediate between the Mycenaean prime and the dawn of history proper. In this case we shall believe that the Homeric warrior has so far adapted to changing conditions the simple appliances of the Mycenaean that he has evolved a feeble corslet with minor pieces of body armour, while retaining the big double-bellied shield as a protection against the arrows which are still the chief weapon of the

rank and file and are even used on occasion by the chiefs. If we further believe that the iron at his disposal was similar to that used by the Celts of Polybius, it is natural to believe also that he preferred the harder bronze for his weapons, though iron was common for domestic and other implements.

On early Greek arms in general see, besides Reichel and Ridgeway *op. cit.*: A. Lang, *Homer and his Age* (London, 1906; and criticisms in *Classical Review*, February 1907); G.G.A. Murray, *The Rise of the Greek Epic* (Oxford, 1907), chap. vi; R.M. Burrows, *Discoveries in Crete* (2nd ed., London, 1907); Leaf and Bayfield, *Iliad*, i.-xii. Appendix A (follows Reichel); W. Helbig, *Homerische Epos* (1884 and 1899), and *La Question mycénienne* (1896); C. Robert, *Studien zur Ilias* (Berlin, 1901); Chr. Tsountas and J.I. Manatt, *The Mycenaean Age* (1897); V. Bérard, *Les Phéniciens et l'Odyssée* (Paris, 1902); Cauer, *Grundfrager d. Homerkritik* (Leipzig, 1895); much valuable discussion will be found in articles in *Journ. Hell, Stud., Classical Rev.* and *Journ. of Anthropol. Instit.*; see also editions of *Iliad* and *Odyssey* (espec. D.B. Monro), and works quoted under AEGEAN CIVILIZATION; HOMER; MYCENAE.

4. *Greek, Historical.*—The equipment does not differ generically from that described in the Homeric poems, except when we come to the reforms of the Macedonians. The hoplites, who formed the main army, wore helmet, body armour, greaves and shield, and fought with pike and sword. The helmets were (1) the Corinthian, which covered the face to the chin, with slits for the eyes, and often had no plume or crest; (2) the Athenian, which did not cover the face (though sometimes it had cheek-plates which could be turned up if necessary), had crests, sometimes triple, with plumes of feathers, horsehair or leather; (3) a steel cap (πῖλος) without crest, plumes or cheek-plates. The last seems to have been most common in the Spartan army. The body armour consisted of breast and back plates fastened

together by thongs or straps and buckles; sometimes poverty compelled a man to be content with a leather jerkin (σπολάς) partly strengthened by metal plates, or even a quilted linen or stuffed shirt. Greaves were of pliant bronze fastened at the back above the ankle and below the knee. Shields were of the small round or oval type, adapted to the new conditions in which the bow and arrow had given place to hand-to-hand fighting. They were held by means of two handles (ὄχανα), the left hand being thrust through the first and grasping the second. In the 5th and 4th centuries the shield bore a device or initial representing the state and also the individual's own crest. The hoplite's pike, about 8 ft. long, unlike the Homeric weapon, was hardly ever thrown. In the Macedonian phalanx a pike (σάρισσα), certainly 18 ft., and perhaps later in the 3rd and and 2nd centuries even 24 ft. long, was introduced. The sword was straight, sharp-pointed, short, sometimes less than 20 in., and rarely more than 2 ft. long. It was double-edged and used for both cut and thrust. A less common type was the μάχαιρα or curved sabre used by the Spartans, with one sharp edge. The hoplite had no other offensive weapons.

The cavalry were heavy-armed like the hoplites except that they carried a smaller shield, or, more usually, none at all. They were armed with a lance which they wielded freely (*i.e.* not "in rest") and occasionally threw. The Macedonian cavalry had a σάρισσα. The light-armed (γυμνῆτες, ψιλοί) were (1) ἀκοντισταί, armed with a javelin (3 to 5 ft. long) and a small shield; (2) τοξόται, archers; and (3) σφενδονῆται, slingers, whose missiles were balls of lead, stones and hardened clay pellets. Between the heavy and the light armed were the peltasts. The *pelta*, from which they took the name, was a light shield or target, made of skin or leather on a wooden or wickerwork frame. The Athenian Iphicrates armed them with linen corslet and a larger spear and sword than those of the hoplites; he also invented a new footgear (called after him *iphicratides*) to replace the older greaves.

5. *Roman.*—The equipment of the Roman soldier, like the organization of the army (see ROMAN ARMY), passed through a great number of changes, and it is quite impossible to summarize it as a single subject. In the period of the kings the legion was the old Greek phalanx with Greek armour; the front ranks wore the Greek panoply and fought with long spears and the circular Argolic shield. The early Roman sword, like that of the Greeks, Egyptians and Etruscans, was of bronze. We have no direct statement as to its form, but in all probability it was of the ordinary leaf-shape. We gather from the monuments that, in the 1st century B.C., the Roman sword was short, worn on the right side (except by officers, who carried no shield), suspended from a shoulder-belt (*balteus*) or a waist-belt (*cingulum*), and reaching from the hollow of the back to the middle of the thigh, thus representing a length of from 22 in. to 2 ft. The blade was straight, double-edged, obtusely-pointed. On the Trajan column (A.D. 114) it is considerably longer, and under the Flavian emperors the long, single-edged *spatha* appears frequently along with the short sword.

The second period ending with the Punic wars witnessed a change. The *hastati* and the *principes* are both heavily armed, but the round shield has given way to the oblong (*scutum*), except for one-third of the *hastati* who bore only the spear and the light javelin (*gaesa*). The third period—that described by Polybius—is characterized by greater complexity of armour, due no doubt in part to the experience gained in conflicts with a wider range of peoples, and in part to the assimilation of the methods peculiar to the new Italian allies. Thus we find the skirmishers (*velites*) armed with a light javelin 3 ft. long and ¾ in. thick, with an iron point 9 in. long; this point was so fragile that it was rendered useless by the first cast. For defence they wore a hide-covered headpiece and a round buckler 3 ft. in diameter. The heavy-armed carried a *scutum* formed of two boards glued together, covered with canvas and skin, and incurved into the shape of a half-cylinder; its upper and lower edges were strengthened with iron rims and its centre with

a boss (*umbo*). A greave was worn on the right leg, and the helmet was of bronze with a crest of three feathers. The wealthier soldiers wore the full cuirass of chain armour (*lorica*), the poorer a brass plate 9 in. square. For offence they carried a sword and two javelins. The former was the Spanish weapon, straight, double-edged and pointed, for both thrust and cut, in place of the old Greek sword.

The characteristic weapon, however, was the *pilum* (Gr. ὑσσός). The form of this weapon and the mode of using it have been minutely described by Polybius (vi. 23), but his description has been much misunderstood in consequence of the rarity of representations or remains of the *pilum*. It is shown on a monument of St Rémy in Provence, assigned to the age of the first emperors, and in a bas-relief at Mainz, on the grave-stone of Quintus Petilius Secundus, a soldier of the 15th legion. A specimen of the actual weapon is in the museum at Wiesbaden. It is a javelin with a stout iron head (7 in.), carried on an iron rod, about 20 in. in length, which terminates in a tang for insertion in the wooden shaft. As represented on the monuments, the iron part of the weapon is about one-third of its entire length (6¾ ft.). It was used primarily as a missile. When the point pierced the shield the weight of the stave pulled the shield downwards and rendered it useless. At close quarters it answered all the purposes, offensive and defensive, of the modern bayonet when "fixed." Vegetius, in his *Rei militaris instituta*, describes it in a modified form as used in the armies of the lower empire, and in a still more modified form it reappears as the "argon" of the Franks. This equipment was characteristic of *hastati, principes* and *triarii* (save that the latter used the *hasta* instead of the *pilum*). We thus see how great is the change from the time when the *hastati* were the light-armed (from *hasta*) of the Greek phalanx.

The cavalry, which had originally been protected only by a light ox-hide shield and the most fragile spears, adopted, about Polybius's time, the full

Greek equipment of buckler, strong spear and breastplate.

In the last period of the republic the *pilum* became the universal weapon of the heavy-armed, while the auxiliaries (all foreigners, the *velites* having disappeared) used the *hasta* and the long single-edged sword (*spatha*). Under the empire the heavy-armed, according to Josephus, had helmet, cuirass, a long sword worn on the left side, and a dagger on the right, *pilum* and *scutum*. The special detachment detailed to attend the commander had a round shield (*clipeus*) and a long spear. The cavalry wore armour like that of the infantry, with a broadsword, a buckler slung from the horse's side, a long pole for thrusting, and several javelins, almost as large as spears, in a sheath or quiver. Arrian, writing of a period some fifty years later, gives further particulars from which we gather that of the cavalry some were bowmen, some polemen, while others wielded lances and axes.

For the arms and armour of other peoples of antiquity see *e.g.* PERSIA: *History, Ancient*, section v. "The Persian Empire of the Achaemenids"; BRITAIN, *Anglo-Saxon*, section v. "Warfare"; ETRURIA; EGYPT, &c.

(J. M. M.)

6. *English from the Norman Conquest.*—It is unnecessary here to trace in detail the history of European armour in the middle ages and after, but its use and fashion in England may illustrate the broad lines of the gradual perfection and the hurried abandonment of the ancient war-harness. Each country gave its armour something of the national character, the Spanish harness being touched with the Moorish taste, the Italian with the classical note borrowed from the monuments of old time, and the German with the Teutonic feeling for the grotesque.

To understand the development of English arms and armour it is well for us to consider carefully the fashion of these things at the time of that landmark of history, the Norman Conquest. Poets, chroniclers and law-

11th-century Bayeux tapestry.

makers give us material for their description, and in the great embroidery of Bayeux, with its more than six hundred lively figures, we have pictured all the circumstances of war. We find that weapons and war gear have advanced little or nothing beyond the age which saw the Dacian warrior armed from crown to foot. A knight is reckoned fully armed if he have helmet, hawberk and shield; his weapons are sword and lance, although he sometimes carries axe or mace and, more rarely, a bow. The coat of fence, which the Norman called *hawberk* and the English *byrnie*, hangs from neck to knee, the sleeves loose and covering the elbow only, the skirt slit before and behind for ease in the saddle. The Bayeux artists (see fig. 4) commonly show these skirts as though they were short breeches, the hawberk taking the fashion at first sight of a man's swimming dress, but other authorities set us right, and towards the end of the tapestry we see men stripping hawberks from the slain by pulling them over the head. Back and front are so much alike that he who armed Duke William for the fight slipped on the armour hind side before, an omen that he should change his state of a duke for that of a king. The hawberk might be mail of woven rings, of rings sewn upon leather or cotton, of overlapping scales of leather, horn or iron, of that jazerant work which was formed of little plates sewn to canvas or linen, or of thick cotton and old linen padded and quilted in lozenges, squares or lines. There are indications that the hawberk was sometimes reinforced at the breast probably by a small oblong plate fastened underneath. Its weight is shown in the scene where William's

FIG. 4.—From the Bayeux Tapestry.

men carry arms to the ships, each hawberk being borne between two men upon a pole thrust through the sleeves.

The helmet is a brimless and pointed cap, either all of metal or of leather or even wood framed and strengthened with metal. Its characteristic piece is the guard which protects the nose and brow from swinging cuts, so disguising the knight that William must needs take off his helmet to show his men that he had not fallen. Such a nasal appears in a 10th-century illumination; at the time of the Conquest it was all but universal. It grows rare and all but disappears in the 13th century, although examples are found to the end of the middle ages. The helmet is laced under the chin, and under it the knight often wore a hood of mail or quilting which covered the top of the head, the ears and neck, but left the chin free—in two or three cases he has this hood without the helmet. A close coif was probably worn beneath it when it was of ringed mail, to spare the fretting of the metal on the head.

The knights' legs are shown in most cases as unprotected save by stout hose or leg-bands: only in two or three instances does the tapestry picture a warrior with armed legs, and it is perhaps significant of the rarity of this defence that the duke is so armed. The feet are covered only by the leather boot, the heels having prick spurs.

Broad-bladed swords with cross-hilts of straight or drooping quills are fastened with a strap and buckle girdle to the left side. They have a short grip, and the blade would seem to be from 2½ to 3 ft. in length. The chieftain unarmed in his house is often seen with unbuckled and sheathed sword sceptre-wise in his hands, carrying it as an Indian raja will nurse his sheathed tulwar. The ash spears brandished or couched by the knights as they charge seem from 7 to 8 or 9 ft. in length. In a few cases a three-forked pennon flutters at the end. The axe, a weapon which the Normans, in spite of their Norse ancestry, do not carry in the battle, is of the type called the Danish axe, long-shafted, the large blade boldly curved out. Maces, such as

that with which the bishop of Bayeux rallies his young men, seem knotted clubs of simple form. Short and strong bows are drawn to the breast by the Norman archers.

Of the shields in the fight, four or five borne by the English are of the old English form—large, round bucklers of linden-wood, bossed and ribbed with iron. For the rest the horsemen bear the Norman shield, kite-shaped, with tapering foot, and long enough to carry a dead warrior from the field. On the inner side are straps for the hand to grip and a long strap allowed the knight to hang the shield from his neck. Let us note that although wyvern-like monsters, crosses, roundels and other devices appear on these shields, none of them has any indication of true armory, whose origins must be placed in the next century.

12th Century.

The 12th century, although an age of riding and warring, affects but little the fashion of armour. The picture of a king on his seal may well stand for the full-armed knight of his age, but Henry Beauclerc, Stephen and Henry II. are shown in harness not much unlike that of the Bayeux needlework. But the sleeve of the hawberk goes to the wrist, and the kite shield grows less, Stephen's shield being 30 in. long at the most. On Stephen's second seal the mail hood is drawn over the point of the chin, and Henry II.'s seals show the chin covered to the lips. At least one seal of this king has the legs and feet armed with hose of ringed mail, probably secured by lacing at the back of the leg as a modern boot is laced. The first seal of Richard Lionheart marks an important movement. His hawberk, hood and hose clothe him, like his father, from crown to toe, and to this equipment he adds gloves of mail. Under the hawberk flows out to the heels the skirt of a long gown slit in front. But helm and shield are the most remarkable points. The shield has become flatter at the top, and at last the shield of an English king bears those armorial devices whose beginnings are seen elsewhere a generation

before. The earlier seal has the shield with a rampant lion ramping to the sinister side and closely resembling that on the shield of Philip of Alsace, long believed to be the earliest example of true armory. But the shield in the second seal bears the three leopards which have been ever since the arms of the kings of England, and from this time to the end of the middle ages armorial devices become the common decorations of the knight's shield, coat, saddle and horse-trapper. The helmet of the first seal is a high thimble-topped cap, without a nasal guard, but the second has the king's head covered with the great helm, barrel-shaped and reinforced in front with a flat ventaile pierced in slits for the sight. This helm is crested with a semicircular ridge from which spring two wings, or rows of feathers fan-wise. On its side the ridge bears a single leopard, the forerunner of the coming crests.

13th Century.

For 13th-century arms, although but poor scraps remain of original material, we have authority in plenty—pictures, seals and carving, and, above all, the effigies in stone or brass which give us each visible link, strap and ornament. All these have for a commentary chronicles, poems and account books, so that the history of armour may be followed in detail.

The long, sleeveless surcoat seen over King John's mail on his broad seal goes through the century and is often embroidered with arms. The shield becomes flat-topped the better to receive armorial charges. The great helm is common, although many knights on the day of battle like better the freedom of the mail hood with a steel cap worn over or under its crown, keeping for the tourney-yard the great helm which towards the century-end begins to carry its towering crest. Great variety is seen in the forms of the flat or round-topped helm, some being in one piece, pierced for sight and air, others having hinged or movable ventailes. At the end of the century a sugar-loaf type is the established form. The knight's hawberk is worn over a

gambeson of linen, quilted linen or cotton, which lesser men wear with a steel cap for all defence. Breast and back plates also are sometimes borne under the hawberk, and the first plates in sight at last appear in those knee-cops which protect the joining of the upper and lower hose, and in a few examples of bainbergs or greaves of metal or leather. At the end of Henry III.'s reign we have the admirable illustrations of a manuscript of Matthew Paris's *Lives of the Offas*, with many pictures of knights. (See fig 5.) Here we see knights with knee-cop and greave and a plenty of curious headpieces, the plain mail hood and mail hoods with a plate ventaile to cover the face, barrel-helms and round-topped helms and even round-topped helmets with the Norman nose-guard.

From *The Ancestor*, by permission of A Constable & Co. Ltd.

FIG. 5.—Knights' Armour, *c.* 1250.

In the last half of the 13th century appears the curious defence known as *alettes*. This name is given to a pair of leather plates generally oblong in form and tagged to the back of the shoulder. As a rule they are borne to display the wearer's arms, but being sometimes plain they may have had some slight defensive value, covering a weak spot at the armpit and turning

a sweeping sword-cut at the neck. They disappear in the earlier years of Edward III.

Surcoat, shield and trapper have the arms of their owner. The rowel-spur makes a rare appearance. Weapons change little. although the sword is often longer and heavier. Richard I. had favoured the cross-bow, in spite of papal denunciations of that weapon hateful to God, and its use is common through all the 13th century, after which it makes way for the national weapon of the long-bow.

14th century.

In the 14th century, the high-day of chivalry, the age of Creçy and Poitiers, of the Black Prince and Chandos, the age which saw enrolled the noble company of the Garter, the art of the armourer and weapon-smith strides forward. At its beginning we see many knights still clad in chain mail with no visible plate. At its end the knight is often locked in plates from head to foot, no chainwork showing save the camail edge under the helm and the fringe of the mail skirt or hawberk.

Before the first quarter of the 14th century is past many of these plates are in common use. Sir John de Creke's brass, about 1325-1330, is a fair example (fig. 6). His helmet is a basinet, pointed at the top, probably worn over a complete hood of mail flowing to the mid-breast. This hood was soon to lose its crown, the later basinets having the camail, a defence of mail covering neck, cheeks and chin and secured to the basinet with eyelet holes and loops through which a lace was passed. A rerebrace of plate defends the outer side of the upper arm, plain elbow-cops the elbow, and round bosses in the form of leopard heads guard the shoulder and the crook of the elbow. The fore-arm is covered with the plates of a vambrace which appears from under the hawberk sleeve. Large and decorated knee-cops cover the knees, ridged greaves the shins, and the upper part of the foot from pointed toe to ankle is fenced with those articulated and overlapping

plates the perfection of which in the next century enabled the full-harnessed knight to move his body as freely as might an unarmed man. Under the plates the mail hose show themselves and the heels have rowelled spurs. He has a hawberk of mail whose front skirt ends in a point between the knees, the loose sleeves between wrist and elbow. Under this is a haketon of some soft material whose folds fall to a line above the height of the knee. Over the hawberk is a garment, perhaps of leather with a dagged skirt-edge, and over this again is a sleeveless gambeson or pourpoint of leather or quilted work, studded and enriched. Over all is the sleeveless surcoat, the skirt before cut squarely off at the height of the fork of the leg, the skirt behind falling to below the knee. The loose folds of this surcoat are gathered at the waist by a narrow belt, the sword hanging from a broader belt carried across the hip. Before 1350 the long surcoat of the 13th century was still further shortened, the tails being cut off squarely with the front. The fate of Sir John Chandos, who in 1369 stumbled on a slippery road, his long coat "armed with his arms" becoming tangled with his legs, points to the fact that an old soldier might cling to an old fashion.

FIG. 6.—Brass of Sir John de Creke.

From Waller's *Monumental Brasses.*

The desire for a better defence than a steel cap and camail and a less cumbrous one than the great helm, in which the knight rode half stifled and half blind, brought in as a fighting headpiece the basinet with a movable viser. This is found throughout this century, disappearing in the next when the salet and its varieties displaced it. But there were many knights who still fought with the great helm covering basinet and camail, a fact which speaks

eloquently of the mighty blows given in this warlike age. The many monumental brasses of the last half of the 14th century show us for the most part knights in basinet and camail with the face exposed, but their heads are commonly pillowed on the great helm and in any case the viser would hinder the artist's desire to show the knight's features.

FIG. 7.—Brass of Sir John de Foxley.

From Waller's *Monumental Brasses*.

The fully-armed man of the latter half of the 14th century seems to have worn a rounded breastplate and a back-plate over his chain hawberk. Chaucer's Sir Thopas must always be cited for the defences of this age, the hero wearing the quilted haketon next his shirt, and over that the habergeon, a lesser hawberk of chain mail. His last defence is a fine hawberk "full strong of plate" showing that "hawberk" sometimes served as a word for the body plates. Over all this is the "cote-armure" or surcoat. Many passages from the chroniclers show that the three coats of fence one over the other were in common use in the field, and Froissart tells a tale of a knight struck by a dart in such wise that the head pierced through his plates, his coat of mail and his haketon stuffed with twisted silk. The surcoat in the age of Edward III. became a scanty garment sitting tightly to the body, laced up the back or sides, the close skirts ending at the fork of the leg with a dagged or slittered edge. The waistbelt is rarely in sight, but the broad belt across the hips, on which the dagger comes to hang as a balance to the sword, grows richer and heavier, the best work of the goldsmith or silversmith being spent upon it. Arms and legs and feet become cased in plate of steel or studded leather, and before the mid-century the shoulder-plates, like the steel shoes, are of

overlapping pieces and the elbow also moves easily under the same defence. (See fig. 7.)

Such harness, ever growing more beautiful in its rich details, serves our champions until the beginning of the 15th century, when the fashion begins to turn. The scanty surcoat tends to disappear. It may be that during the bitter feuds and fierce slaughters of the Wars of the Roses men were unwilling to display on their breasts the bearings by which their mortal foe might know them afar. The horseman's shield went with the surcoat, its disuse hastened by the perfection of armour, and the banners of leaders remained as the only armorial signs commonly seen in war. But at jousts and tourneys, where personal distinction was eagerly sought, the loose tabard, which, after the middle of the century, bore the arms of the wearer on back, front and both sleeves, was still to be seen, with the crest of parchment or leather towering above a helm whose mantle, from the ribbon-like strip of the early 13th century, had grown into a fluttering cloak with wildly slittered edge streaming out behind the charging knight.

15th century.

FIG. 8.—Brass of Sir John Lisle at Thruxton.

When a score of years of this 15th century had run we find the knight closed in with plates, no edge of chain mail remaining in sight. The surcoat being gone we see him armed in breast and back plate, his loins covered by a skirt of "tonlets," as the defence of overlapping horizontal bands comes to be named (fig. 8). The chain camail has gone out of fashion, the basinet continuing itself with a chin and cheek plate which joins a gorget of plate

covering the collar-bone, a movable viser shutting in the whole head with steel. The gussets of chain mail sewn into the leathern or fustian doublet worn below the body armour are unseen even at the gap at the hollow of the arm where the plates must be allowed to move freely, for a little plate, round, oval or oblong, is tagged to each side to fence the weak point. These plates often differ in size and shape one from the other, the sword-arm side carrying the smaller one.

FIG. 9.—Gothic Style of Armour. Monument of Count Otto IV. of Henneberg.

Soon after this the six or eight “tonlets” grow fewer, being continued on the lower edge by the so-called tuilles, small plates strapped to the tonlets and swinging with the movement of the legs. A fine suit of armour is shown in the monument of Count Otto IV. of Henneberg (fig. 9). Knightly armour takes perhaps its last expression of perfection in such a noble harness as that worn by Richard Beauchamp, earl of Warwick, whose armed effigy was wrought between 1451 and 1454 (fig. 10). In this we see the characteristic feature of the great elbow-cops, whose channelled and fluted edges overlapping vambrace and rerebrace become monstrous fan-like shapes in the brass of Richard Quartremayns, graven about 1460. At this time the harness of the left shoulder is often notably reinforced, as compared with that of the sword-arm shoulder. Towards the latter part of the century chain mail reappears as a skirt or breech of mail, showing itself under the diminished tonlets, and, when helm and gorget are removed, as a high-standing collar. The articulation by overlapping plates extends even to the breastplate, whose front is thus in two or more pieces. Very long-necked rowel-spurs are often found, and the toes of the sabbatons or steel shoes are sharply pointed. The characteristic helmet of the latter half of the century is the salet or salade, a large steel cap, whose edge is carried out from the brows and still more boldly at the back of the neck.

Knights abandon the great helm in war, but it is perfected for use in the tilt-yard, taking for that purpose an enormous size, to enable two good inches of stuffing to come between head or face and the steel plate. Such a helm sits well down on the shoulders, to which it is locked before and behind by strong buckles or rivets. The note of the 15th century in armour is that of fantastically elaborate forms boldly outlined and a splendour of colour which gained much from the custom of wearing over the full harness short cloaks or rich coats turned up with furs, or from another fashion of

covering the body plates or brigandines with rich velvets studded with gold. The details of the harness take a thousand curious shapes, and even amongst the simpler jacks and steel caps of the archers the same glorious variety is seen.

FIG. 10.—Brass of Richard Beachamp, earl of Warwick.

From Stothard's *Monumental Effigies*.

If the note of the 15th century be variety of form, that of the 16th century, the last important chapter in the history of armour, is surface decoration, the harness of great folk atoning in some measure for loss of the beautiful medieval sense of line by elaborate enrichment. Plain engraving, niello, russet work, golden inlay and beaten ornament are common methods of enrichment. The great plume of ostrich feathers flows from the helmet crown of leaders in war. As in the reign of Edward III., costume's fashion affects the forms of armour, the broad toe of the Henry VIII. shoe being imitated in steel, as the wide fluted skirts of the so-called Maximilian armour imitate the German fashion in civil dress which the Imperial host popularized through northern Europe (fig. 11). These skirts have been called "lamboys" by modern writers on military antiquities, but the word seems an antiquarianism of no value, apparently a misreading of the word "jambeis" in some early document. So many notable examples of the armour of this 16th century are accessible in European collections, other illustrations occurring in great plenty, that its details call for little discussion; a fine and characteristic suit is that by the

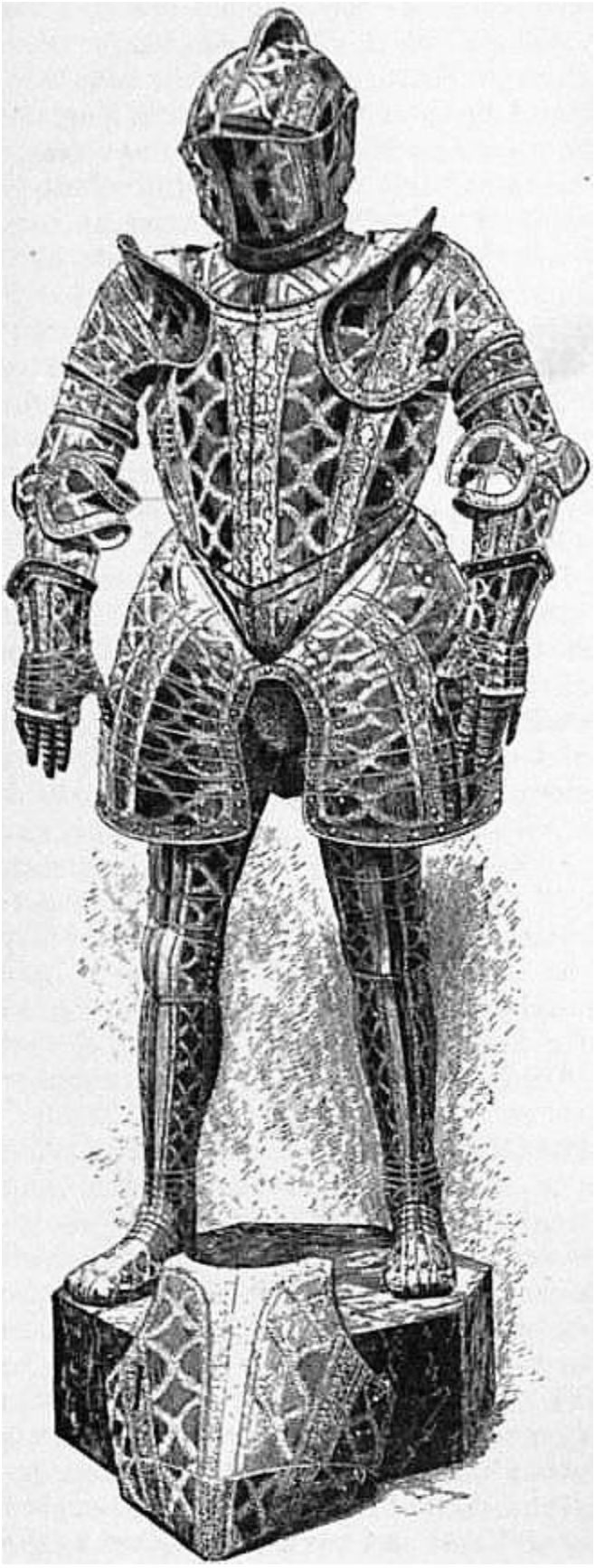
16th century.

famous English armourer, Jacob Topf (fig. 12), which belonged to Sir Christopher Hatton. Into this century the arquebusier marches, demanding a chief place in the line of battle, although it is a common error that the improvement in fire-arms drove out the fully armed warrior, whose plates gave him no protection. Until the rifle came to the soldier's hands, plate armour could easily be made shot-proof. It was driven from the field by the new strategy which asked for long marches and rapid movements of armies. This century's armour for the tilt-yard gives such protection to the champion, with its many reinforcing pieces, that unless the caged helm were used—the same which cost Henry II. of France his life—the risks of the tilt-yard must have fallen much below those of the polo-field. The horse with crinet, chafron and bards of steel was as well covered from harm.

From Hewitt's *Arms and Armour.*

FIG. 11.—Meeting of Henry VIII. and Maximilian.

Before the end of the 16th century the full suit of war harness is an antique survival. Long boots take the place of greaves and steel shoes, and early in the 16th century the military pedants are heard to bewail the common laying aside of other pieces. The mounted cavalier—cuirassier or pistolier—might take the field, even as late as the Great Rebellion, armed at all points save the backs of the thighs and the legs below the knee; but a combed and brimmed cap, breast and back plate and tassets equipped the pikeman, and the musketeer would march without any metal on him save his headpiece, for it was soon found that heavily armed musketeers, after a long trudge through summer dust or winter mud, were readier to rest than to shoot. Everywhere



there was revolt against the burden of plates, and as early as 1593 Sir Richard Hawkins found that his adventurers would not use even the light corslets provided by him, "esteeming a pot of wine a better defence." Gervase Markham, in his *Souldier's Accidence* of 1645, asks that at least the captain of cuirassiers should be armed "at all peeces, cap a pee," but he would have found few such captains, and Markham is a great praiser of noble old custom. The famous figure of a pikeman of 1668 (fig. 13) in Elton's *Art Military* has steel cap, corslet and tassets, but he stands for a fashion dead or dying. The last noteworthy helmet was what is now termed the lobster-tail helmet, a headpiece with round top, flat brim before, a broad articulated brim behind, cheek-pieces

FIG. 12—Suit by Jacob Topf, nearly complete, the gorget does not belong to it. Below is the placcate.

hanging by straps and a grate of upright bars to cover the face, some having in place of the grate a movable nose-guard to be raised or lowered at will. The close resemblance of this helmet to that worn by the Japanese, with whom the Dutch were then trading, is worth remark, although each of the two pieces seems to have had its separate origin. Thus, save for a steel cap here and a corslet there, especially to be found amongst the guards of sovereigns who must cling to something of antique tradition, armour departs out of the civilized world.

Survival of armour.

When in the reign of Queen Victoria her mounted guardsmen were given back their breast and back plates, the last piece of body armour had been the tiny gilt crescent worn at the throat by officers of foot, which crescent was the shrunken symbol of that great gorget of plate that came in with the 13th century. The shining plates of the Guards are parade pieces only, but a curious revival of an old defence was carried by English cavalry in the field at the end of the 19th century, when small gussets of chain mail were attached to the shoulders of certain cavalrymen as a defence against sword cuts. Through all the age of modern warfare inventors have pressed the claims of various bullet-proof breastplates, but where they have been effective against rifle fire their weight has made them too heavy

FIG. 13—Pikeman.

From *The Compleat Body of the Art Military*, by Lieut. Col. Elton (1668).

an addition to the soldier's burden. (See, however, ARMOUR PLATES, *ad fin.*) Last of all we may reckon those secret coats of mail which are said to be worn on occasion by modern rulers in dread of the assassin. The London detective department has such coats of fence in its armoury; and on the other side it may be remembered that the Kelly gang of bushrangers, driven to bay, were found to have forged suits of plate for themselves out of sheets of boiler-iron.

Collections.

Ancient arms and armour are now eagerly sought by European and American collectors, and high prices are paid down for every noteworthy piece. The supply is assisted by the efforts of many forgers of false pieces, the most cunning of whom bring all archaeological skill to their aid, and few great national or private collections are free from some example of this industry. For the genuine pieces competition runs high. Suits of plate of the earliest period may be sought in vain, and the greatest collectors may hardly hope for such a panoply of the late Gothic period as that which is the ornament of the Wallace collection. Even this famous harness is not wholly free from suspicion of restoration. Armour of the latter half of the 16th century, however, often appears in the sale-rooms and is found in many private collections, although the "ancestral armour" which decorates so many ancient halls in England is generally the plates and pots which served the pikemen of the 17th-century militia.

It is not hard to understand this scarcity of ancient pieces. In the first place it must be remembered that the fully armed man was always a rare figure in war, and only the rich could engage in the costly follies of the later tournaments. The novelists have done much to encourage the belief that most men of gentle rank rode to the wars lance in hand, locked up in full harness of plate; but the country gentleman, serving as light horseman or mounted archer, would hold himself well armed had he a quilted jack or

brigandine and a basinet or salet. Men armed *cap a pee* crowd the illuminations of chronicle books, the artists having the same tastes as the boy who decorates his Latin grammar with battles which are hand-to-hand conflicts of epauletted generals. Monuments and brasses also show these fully armed men, but here again we must recognize the tendency which made the last of the cheap miniaturists endow their clients lavishly with heavy watch-chains and rings. As late as the 18th century the portrait painters drew their military or naval sitters in the breastplates and pauldrons, vambraces and rerebraces of an earlier age. Ancient wills and inventories, save those of great folk or military adventurers, have scanty reference to complete harnesses. Ringed hawberks, in a damp northern climate, will not survive long neglect, and many of them must have been cut in pieces for burnishers or for the mail skirts and gussets attached to the later arming doublets. As the fashion of plate armour changed, the smith might adapt an old harness to the new taste, but more often it would be cast aside. Men to whom the sight of a steel coat called up the business of their daily life wasted no sentimentality over an obsolete piece. The early antiquaries might have saved us many priceless things, but it was not until a few *virtuosi* of the 18th century were taken with the Gothic fancy that popular archaeology dealt with aught but Greek statuary and Roman inscriptions. The 19th century was well advanced before an interest in medieval antiquities became common amongst educated men, and for most contemporaries of Dr Johnson a medieval helm was a barbarous curiosity exciting the same measure of mild interest as does the Zulu knobkerry seen by us as we pass a pawnbroker's window.

(O. Ba.)

7. *Fire-arms.* (For the development of cannon, see Artillery and Ordnance.)—Hand-cannons appear almost simultaneously with the larger *bombards*. They were made by the Flemings in the 14th century. An early instance of the use of hand fire-arms in England is the siege of

Huntercombe Manor in 1375. These were simply small cannon, provided with a stock of wood, and fired by the application of a match to the touch-hole. During the 15th century the hand-gun was steadily improved, and its use became more general. Edward IV., landing in England in 1471 to reconquer his throne, brought with him a force of Burgundian hand-gun men (mercenaries), and in 1476 the Swiss at Morat had no less than 6000 of their men thus armed. The prototype of the modern military weapon is the *arquebus* (*q.v.*), a form of which was afterwards called in England the *caliver*. Various dates are given for the introduction of the arquebus, which owed many of its details to the perfected crossbow which it superseded. The Spanish army in the Italian wars at the beginning of the 16th century was the first to make full and effective use of the new weapon, and thus to make the fire action of infantry a serious factor in the decision of battles. The Spaniards also took the next step in advance. The *musket* (*q.v.*) was heavier and more powerful than the arquebus, and, in the hands of the duke of Alva's army in the Netherlands, so conclusively proved its superiority that it at once replaced its rival in the armies of Europe. Both the arquebus and the musket had a touch-hole on the right side of the barrel, with a pan for the priming, with which a lighted quick match was brought in contact by pressing a trigger. The musket, on account of its weight, was provided with a long rest, forked in the upper part and furnished with a spike to stick in the ground. The *matchlock* (long-barrelled matchlocks are still used by various uncivilized peoples, notably in India) was the typical weapon of the soldier for two centuries. The class of hand fire-arms provided with an arrangement for striking a spark to ignite the powder charge begins with the *wheel-lock*. This lock was invented at Nuremberg in 1515, but was seldom applied to the arquebus and musket on account of the costliness of its mechanism and the uncertainty of its action. The early forms of flint-lock (*snaphance*) were open to the same objections, and the *fire-lock* (as the flint-lock was usually called) remained for many years after its introduction

the armament of special troops only, till about the beginning of the 18th century it finally superseded the old matchlock. Thenceforward the fire-lock (called familiarly in England “Brown Bess”) formed with the bayonet (*q.v.*) the armament of all infantry, and the fire-arms carried by other troops were constructed on the same principle. Flint-lock muskets were supplanted about 1830-1840 by the percussion musket, in which a fulminate cap was used. A Scottish clergyman, Alexander Forsyth, invented this method of ignition in 1807, but it was not till 1820 that it began to come into general use. (See GUN.) The system of firing the charge by a fulminate was followed by the invention of the needle-gun (*q.v.*). The muzzle-loading rifle, employed by special troops since about 1800, came into general use in the armies of Europe about 1854-1860. It was superseded, as a result of the success of the needle-gun in the war of 1866, by the breech-loading rifle, this in its turn giving way to the magazine rifle about 1886-1890. (See RIFLE.) Neither breech-loaders nor revolvers, however, are inventions of modern date. Both were known in Germany as early as the close of the 15th century. There are in the Musée d’Artillerie at Paris wheel-lock arquebuses of the 16th century which are breech-loaders; and there is, in the Tower armoury, a revolver with the old matchlock, the date of which is about 1550. A German arquebus of the 16th century, in the museum of Sigmaringen, is a revolver of seven barrels. Nor is rifling a new thing in fire-arms, for there was a rifled arquebus of the 15th century, in which the balls were driven home by a mallet, and a patent was taken out in England for rifling in 1635. All these systems were thus known at an early period in the history of fire-arms, but for want of the minutely accurate workmanship required and, above all, of a satisfactory firing arrangement, they were left in an undeveloped state until modern times. The earliest pistols were merely shorter handguns, modified for mounted men, and provided with a straight stock which was held against the breastplate (poitrinal or petronel). The long-barrelled pistol was the typical weapon of the cavalry of the 16th

century. (See CAVALRY.) With the revival of shock tactics initiated by Gustavus Adolphus the length of the pistol barrel became less and less, and its stock was then shaped for the hand alone. (See PISTOL.)

(C. F. A.)

ARMSTEAD, HENRY HUGH (1828-1905), English sculptor, was first trained as a silversmith, and achieved the highest excellence with the "St George's Vase" and the "Outram Shield." He rose to the front rank among contemporary sculptors, his chief works being the external sculptural decorations of the colonial office in Whitehall, the sculptures on the southern and eastern sides of the podium of the Albert Memorial, the large fountain at King's College, Cambridge, and numerous effigies, such as "Bishop Wilberforce" at Winchester, and "Lord John Thynne" at Westminster, with smaller portraiture and much ideal work. His sense of style and nobility was remarkable; and he was besides gifted with a fine power of design and draughtsmanship, which he put to good use in his early years for book illustration. He was elected associate of the Royal Academy in 1875 and a full member in 1880.

ARMSTRONG, ARCHIBALD (d. 1672), court jester, called "Archy," was a native of Scotland or of Cumberland, and according to tradition first

distinguished himself as a sheep-stealer; afterwards he entered the service of James VI., with whom he became a favourite. When the king succeeded to the English throne, Archy was appointed court jester. In 1611 he was granted a pension of two shillings a day, and in 1617 he accompanied James on his visit to Scotland. His influence was considerable and he was greatly courted and flattered, but his success appears to have turned his head. He became presumptuous, insolent and mischievous, excited foolish jealousies between the king and Henry, prince of Wales, and was much disliked by the members of the court. In 1623 he accompanied Prince Charles and Buckingham in their adventure into Spain, where he was much caressed and favoured by the Spanish court and, according to his own account, was granted a pension. His conduct here became more intolerable than ever. He rallied the infanta on the defeat of the Armada and censured the conduct of the expedition to Buckingham's face. Buckingham declared he would have him hanged, to which the jester replied that "dukes had often been hanged for insolence but never fools for talking." On his return he gained some complimentary allusions from Ben Jonson by his attacks upon the Spanish marriage. He retained his post on the accession of Charles I., and accumulated a considerable fortune, including the grant by the king of 1000 acres in Ireland. After the death of Buckingham in 1628, whom he declared "the greatest enemy of three kings," the principal object of his dislike and rude jests was Laud, whom he openly vilified and ridiculed. He pronounced the following grace at Whitehall in Laud's presence: "Great praise be given to God and little *laud* to the devil," and after the news of the rebellion in Scotland in 1637 he greeted Laud on his way to the council chamber at Whitehall with: "Who's fool now? Does not your Grace hear the news from Stirling about the liturgy?" On Laud's complaint to the council, Archy was sentenced the same day "to have his coat pulled over his head and be discharged the king's service and banished the king's court." He settled in London as a money-lender, and many complaints were made to the privy

council and House of Lords of his sharp practices. In 1641 on the occasion of Laud's arrest, he enjoyed a mean revenge by publishing *Archy's Dream; sometimes Jester to his Majestie, but exiled the Court by Canterburie's malice*. Subsequently he resided at Arthuret in Cumberland, according to some accounts his birthplace, where he possessed an estate, and where he died in 1672, his burial taking place on the 1st of April. He was twice married, his second wife being Sybilla Bell. There is no record of any legal offspring, but the baptism of a "base son" of Archibald Armstrong is entered in the parish register of the 17th of December 1643. *A Banquet of Jests: A change of Cheare*, published about 1630, a collection chiefly of dull, stale jokes, is attributed to him, and with still less reason probably *A choice Banquet of Witty Jests ... Being an addition to Archee's Jests, taken out of his Closet but never published in his Lifetime* (1660).

ARMSTRONG, JOHN (1709-1779), British physician and writer, was born about 1709 at Castletown, Roxburghshire, where his father was parish minister. He graduated M.D. (1732) at Edinburgh University, and soon afterwards settled in London, where he paid more attention to literature than to medicine. He was, in 1746, appointed one of the physicians to the military hospital behind Buckingham House; and, in 1760, physician to the army in Germany, an appointment which he held till the peace of 1763, when he retired on half-pay. For many years he was closely associated with John Wilkes, but quarrelled with him in 1763. He died on the 7th of September 1779. Armstrong's first publication, an anonymous one, entitled *An Essay for Abridging the Study of Physic* (1735), was a satire on the

ignorance of the apothecaries and medical men of his day. This was followed two years after by the *Economy of Love*, a poem the indecency of which damaged his professional practice. In 1744 appeared his *Art of Preserving Health*, a very successful didactic poem, and the one production on which his literary reputation rests. His *Miscellanies* (1770) contains some shorter poems displaying considerable humour.

ARMSTRONG, JOHN (1738-1843), American soldier, diplomatist and political leader, born at Carlisle, Pennsylvania, on the 25th of November 1758. His father, also named John Armstrong (1725-1795), a native of the north of Ireland, who had emigrated to the Pennsylvania frontier between 1745 and 1748, served successively as a brigadier-general in the Continental army (1776-77), as brigadier-general and then major-general of the Pennsylvania militia (1777-83), during the War of Independence, and was a member of the Continental Congress in 1779-1780 and again in 1787-1788. The son studied for a time at the College of New Jersey (now Princeton University), and served as a major in the War of Independence. In March 1783, while the Continental army was stationed at Newburgh (*q.v.*), New York, he wrote and issued, anonymously, the famous "Newburgh Addresses." In 1784 he led a force of Pennsylvania militia against the Connecticut settlers in Wyoming Valley, and treated them in such a high-handed manner as to incur the disapproval even of the Pennsylvania legislature. In 1789 he married the sister of Chancellor Robert R. Livingston of New York, and removed to New York city, where his own ability and his family connexion gave him great political influence. In

1801-2 and again in 1803-4 he was a member of the United States Senate. From 1804 to 1810 he was the United States minister to France, and in March 1806 he was joined with James Bowdoin as a special minister to treat through France with Spain concerning the acquisition of Florida, Spanish spoliations of American commerce, and the "Louisiana" boundary. During the War of 1812, he was a brigadier-general in the United States army from July 1812 until January 1813, and from then until August 1814 secretary of war in the cabinet of President Madison, when his unpopularity forced him to resign. "In spite of Armstrong's services, abilities and experience," says Henry Adams, "something in his character always created distrust. He had every advantage of education, social and political connexion, ability and self-confidence; ... but he suffered from the reputation of indolence and intrigue." Nevertheless, he "introduced into the army an energy wholly new," an energy the results of which were apparent "for half a century." After his resignation he lived in retirement at Red Hook, New York, where he died on the 1st of April 1843. He published *Notices of the War of 1812* (2 vols., 1836; new ed., 1840), the value of which is greatly impaired by its obvious partiality.

The best account of Armstrong's career as minister to France and as secretary of war may be found in Henry Adams's *History of the United States, 1801-1817* (9 vols., New York, 1889-1890).

ARMSTRONG, SAMUEL CHAPMAN (1839-1893), American soldier, philanthropist and educator, was born on Maui, one of the Hawaiian Islands, on the 30th of January 1839, his parents Richard and Clarissa

Armstrong, being American missionaries. He was educated at the Punahou school in Honolulu, at Oahu College, into which the Punahou school developed in 1852, and at Williams College, Williamstown, Massachusetts, where he graduated in 1862. He served in the Civil War, on the Union side, from 1862 to 1865, rising in the volunteer service to the regular rank of colonel and the brevet rank of brigadier-general, and, after December 1863, acted as one of the officers of the coloured troops commanded by General William Birney. In November 1865 he was honourably mustered out of the volunteer service. His experience as commander of negro troops had added to his interest, always strong, in the negroes of the south, and in March 1866 he became superintendent of the Ninth District of Virginia, under the Freedman's Bureau, with headquarters near Fort Monroe. While in this position he became convinced that the only permanent solution of the manifold difficulties which the freedmen encountered lay in their moral and industrial education. He remained in the educational department of the Bureau until this work came to an end in 1872; though five years earlier, at Hampton, Virginia, near Fort Monroe, he had founded, with the aid principally of the American Missionary Association, an industrial school for negroes, Hampton Institute, which was formally opened in 1868, and at the head of which he remained until his death, there, on the 11th of May 1893. After 1878 Indians were also admitted to the Institute, and during the last fifteen years of his life Armstrong took a deep interest in the "Indian question." Much of his time after 1868 was spent in the Northern and Eastern states, whither he went to raise funds for the Institute. See *Samuel Chapman Armstrong, a Biographical Study* (New York, 1904), by his daughter, Edith Armstrong Talbot.

His brother, WILLIAM N. ARMSTRONG, was attorney-general in the cabinet of the Hawaiian king Kalakaua I. He accompanied that monarch on a prolonged foreign tour in 1881, visiting Japan, China, Siam, India, Europe

and the United States, and in 1904 published an amusing account of the journey, called *Round the World with a King*.

ARMSTRONG, WILLIAM GEORGE ARMSTRONG, BARON (1810-1900), British inventor, founder of the Elswick manufacturing works, was born on the 26th of November 1810, at Newcastle-on-Tyne, and was educated at a school in Bishop Auckland. The profession which he adopted was that of a solicitor, and from 1833 to 1847 he was engaged in active practice in Newcastle as a member of the firm of Donkin, Stable & Armstrong. His sympathies, however, were always with mechanical and scientific pursuits, and several of his inventions date from a time anterior to his final abandonment of the law. In 1841-1843 he published several papers on the electricity of effluent steam. This subject he was led to study by the experience of a colliery engineman, who noticed that he received a sharp shock on exposing one hand to a jet of steam issuing from a boiler with which his other hand was in contact, and the inquiry was followed by the invention of the "hydro-electric" machine, a powerful generator of electricity, which was thought worthy of careful investigation by Faraday. The question of the utilization of water-power had engaged his attention even earlier, and in 1839 he invented an improved rotary water motor. Soon afterwards he designed a hydraulic crane, which contained the germ of all the hydraulic machinery for which he and Elswick were subsequently to become famous. This machine depended simply on the pressure of water acting directly in a cylinder on a piston, which was connected with suitable multiplying gear. In the first example, which was erected on the quay at

Newcastle in 1846, the necessary pressure was obtained from the ordinary water mains of the town; but the merits and advantages of the device soon became widely appreciated, and a demand arose for the erection of cranes in positions where the pressure afforded by the mains was insufficient. Of course pressure could always be obtained by the aid of special reservoirs, but to build these was not always desirable, or even practicable. Hence, when in 1850 a hydraulic installation was required for a new ferry station at New Holland, on the Humber estuary, the absence of water mains of any kind, coupled with the prohibitive cost of a special reservoir owing to the character of the soil, impelled him to invent a fresh piece of apparatus, the "accumulator," which consists of a large cylinder containing a piston that can be loaded to give any desired pressure, the water being pumped in below it by a steam-engine or other prime mover. This simple device may be looked upon as the crown of the hydraulic system, since by its various modifications the installation of hydraulic power became possible in almost any situation. In particular, it was rendered practicable on board ship, and its application to the manipulation of heavy naval guns and other purposes on warships was not the least important of Armstrong's achievements.

The Elswick works were originally founded for the manufacture of this hydraulic machinery, but it was not long before they became the birthplace of a revolution in gunmaking; indeed, could nothing more be placed to Armstrong's credit than their establishment, his name would still be worthy of remembrance. Modern artillery dates from about 1855, when Armstrong's first gun made its appearance. This weapon embodied all the essential features which distinguish the ordnance of to-day from the cannon of the middle ages—it was built up of rings of metal shrunk upon an inner steel barrel; it was loaded at the breech; it was rifled; and it threw, not a round ball, but an elongated projectile with ogival head. The guns constructed on this principle yielded such excellent results, both in range and accuracy, that they were adopted by the British government in 1859,

Armstrong himself being appointed engineer of rifled ordnance and receiving the honour of knighthood. At the same time the Elswick Ordnance Company was formed to manufacture the guns under the supervision of Armstrong, who, however, had no financial interest in the concern; it was merged in the Elswick Engineering Works four years later. Great Britain thus originated a principle of gun construction which has since been universally followed, and obtained an armament superior to that possessed by any other country at that time. But while there was no doubt as to the shooting capacities of these guns, defects in the breech mechanism soon became equally patent, and in a few years caused a reversion to muzzle-loading. Armstrong resigned his position in 1863, and for seventeen years the government adhered to the older method of loading, in spite of the improvements which experiment and research at Elswick and elsewhere had during that period produced in the mechanism and performance of heavy guns. But at last Armstrong's results could no longer be ignored; and wire-wound breech-loading guns were received back into the service in 1880. The use of steel wire for the construction of guns was one of Armstrong's early ideas. He perceived that to coil many turns of thin wire round an inner barrel was a logical extension of the large hooped method already mentioned, and in conjunction with I.K. Brunel, was preparing to put the plan to practical test when the discovery that it had already been patented caused him to abandon his intention, until about 1877. This incident well illustrates the ground of his objection to the British system of patent law, which he looked upon as calculated to stifle invention and impede progress; the patentees in this case did not manage to make a practical success of their invention themselves, but the existence of prior patents was sufficient to turn him aside from a path which conducted him to valuable results when afterwards, owing to the expiry of those patents, he was free to pursue it as he pleased.

Lord Armstrong, who was raised to the peerage in 1887, was the author of *A Visit to Egypt* (1873), and *Electric Movement in Air and Water* (1897), besides many professional papers. He died on the 27th of December 1900, at Rothbury, Northumberland. His title became extinct, but his grand-nephew and heir, W.H.A.F. Watson-Armstrong (b. 1863), was in 1903 created Baron Armstrong of Bamburgh and Cragside.

ARMY (from Fr. *armée*, Lat. *armata*), a considerable body of men armed and organized for the purpose of warfare on land (Ger. *Armee*), or the whole armed force at the disposal of a state or person for the same purpose (Ger. *Heer* = host). The application of the term is sometimes restricted to the permanent, active or regular forces of a state. The history of the development of the army systems of the world is dealt with in this article in sections 1 to 38, being followed by sections 39 to 59 on the characteristics of present-day armies. The remainder of the article is devoted to sections on the history of the principal armies of Europe, and that of the United States. For the Japanese Army see JAPAN, and for the existing condition of the army in each country see under the country heading.

GENERAL HISTORY

1. *Early Armies.*—It is only with the evolution of the specially military function in a tribe or nation, expressed by the separation of a warrior-class, that the history of armies (as now understood) commences. Numerous

savage tribes of the present day possess military organizations based on this system, but it first appears in the history of civilization amongst the Egyptians. By the earliest laws of Egypt, provision was made for the support of the warriors. The exploits of her armies under the legendary Sesostris cannot be regarded as historical, but it appears certain that the country possessed an army, capable of waging war in a regular fashion, and divided thus early into separate arms, these being chariots, infantry and archers. The systems of the Assyrians and Babylonians present no particular features of interest, save that horsemen, as distinct from charioteers, appear on the scene. The first historical instance of a military organization resembling those of modern times is that of the Persian empire.

2. *Persia.*—Drawn from a hardy and nomadic race, the armies of Persia at first consisted mainly of cavalry, and owed much of their success to the consequent ease and rapidity of their movements. The warlike Persians constantly extended their power by fresh conquests, and for some time remained a distinctly conquering and military race, attaining their highest power under Cyrus and Cambyses. Cyrus seems to have been the founder of a comprehensive military organization, of which we gather details from Xenophon and other writers. To each province was allotted a certain number of soldiers as standing army. These troops, formed originally of native Persians only, were called the king's troops. They comprised two classes, the one devoted exclusively to garrisoning towns and castles, the other distributed throughout the country. To each province was appointed a military commander, responsible for the number and efficiency of the troops in his district, while the civil governor was answerable for their subsistence and pay. Annual musters were held, either by the king in person or by generals deputed for the purpose and invested with full powers. This organization seems to have fully answered its original purpose, that of holding a vast empire acquired by conquest and promptly repelling inroads or putting down insurrections. But when a great foreign war was

contemplated, the standing army was augmented by a levy throughout the empire. The extent of the empire made such a levy a matter of time, and the heterogeneous and unorganized mass of men of all nations so brought together was a source of weakness rather than strength. Indeed, the vast hosts over which the Greeks gained their victories comprised but a small proportion of the true Persians. The cavalry alone seems to have retained its national character, and with it something of its high reputation, even to the days of Alexander.

3. *Greece.*—The Homeric armies were tribal levies of foot, armed with spear, sword, bow, &c., and commanded by the chiefs in their war-chariots. In historic times all this is changed. Greece becomes a congeries of city-states, each with its own citizen-militia. Federal armies and permanent troops are rare, the former owing to the centrifugal tendency of Greek politics, the latter because the "tyrannies," which must have relied very largely on standing armies to maintain themselves, had ultimately given way to democratic institutions. But the citizen-militia of Athens or Sparta resembled rather a modern "nation in arms" than an auxiliary force. Service was compulsory in almost all states, and as the young men began their career as soldiers with a continuous training of two or three years, Hellenic armies, like those of modern Europe, consisted of men who had undergone a thorough initial training and were subsequently called up as required. Cavalry, as always in the broken country of the Peloponnesus, was not of great importance, and it is only when the theatre of Greek history is extended to the plains of Thessaly that the mounted men become numerous. In the 4th century the mainstay of Greek armies was the *hoplite* (ὁπλίτης), the heavy-armed infantryman who fought in the *corps de bataille*; the light troops were men who could not provide the full equipment of the hoplite, rather than soldiers trained for certain special duties such as skirmishing. The fighting formation was that of the *phalanx*, a solid corps of hoplites armed with long spears. The armies were recruited for each war by calling

up one or more classes of men in reserve according to age. It was the duty and privilege of the free citizen to bear arms; the slaves were rarely trusted with weapons.

4. *Sparta.*—So much is common to the various states. In Sparta the idea of the nation in arms was more thoroughly carried out than in any other state in the history of civilization. In other states the individual citizen often lived the life of a soldier, here the nation lived the life of a regiment. Private homes resembled the "married quarters" of a modern army; the unmarried men lived entirely in barracks. Military exercises were only interrupted by actual service in the field, and the whole life of a man of military age was devoted to them. Under these circumstances, the Spartans maintained a practically unchallenged supremacy over the armies of other Greek states; sometimes their superiority was so great that, like the Spanish regulars in the early part of the Dutch War of Independence, they destroyed their enemies with insignificant loss to themselves. The surrender of a Spartan detachment, hopelessly cut off from all assistance, and the victory of a body of well-trained and handy light infantry over a closed battalion of Spartiates were events so unusual as seriously to affect the course of Greek history.

5. *Greek Mercenaries.*—The military system of the 4th century was not called upon to provide armies for continuous service on distant expeditions. When, after the earlier campaigns of the Peloponnesian War, the necessity for such expeditions arose, the system was often strained almost to breaking point, (*e.g.* in the case of the Athenian expedition to Syracuse), and ultimately the states of Greece were driven to choose between unprofitable expenditure of the lives of citizens and recruiting from other sources. Mercenaries serving as light troops, and particularly as *peltasts* (a new form of disciplined "light infantry") soon appeared. The *corps de bataille* remained for long the old phalanx of citizen hoplites. But the heavy losses of many years told severely on the resources of every state, and ultimately

non-national recruits—adventurers and soldiers of fortune, broken men who had lost their possessions in the wars, political refugees, runaway slaves, &c.—found their way even into the ranks of the hoplites, and Athens at one great crisis (407) enlisted slaves, with the promise of citizenship as their reward. The Arcadians, like the Scots and the Swiss in modern history, furnished the most numerous contingent to the new professional armies. A truly national army was indeed to appear once more in the history of the Peloponnesus, but in the meantime the professional soldier held the field. The old bond of strict citizenship once broken, the career of the soldier of fortune was open to the adventurous Greek. Taenarum and Corinth became regular *entrepôts* for mercenaries. The younger Cyrus raised his army for the invasion of Persia precisely as the emperors Maximilian and Charles V. raised regiments of *Landsknechte*—by the issue of recruiting commissions to captains of reputation. This army became the famous Ten Thousand. It was a marching city-state, its members not desperate adventurers, but men with the calm self-respect of Greek civilization. On the fall of its generals, it chose the best officers of the army to command, and obeyed implicitly. Cheirisophus the Spartan and Xenophon the Athenian, whom they chose, were not plausible demagogues; they were line officers, who, suddenly promoted to the chief command under circumstances of almost overwhelming difficulty, proved capable of achieving the impossible. The merit of choosing such leaders is not the least title to fame of the Ten Thousand mercenary Greek hoplites. About the same time Iphicrates with a body of mercenary *peltasts* destroyed a *mora* or corps of Spartan hoplites (391 B.C.).

6. *Epaminondas.*—Not many years after this, Spartan oppression roused the Theban revolt, and the Theban revolt became the Theban hegemony. The army which achieved this under the leadership of Epaminondas, one of the great captains of history, had already given proofs of its valour against

Xenophon and the Cyreian veterans. Still earlier it had won the great victory of Delium (424 B.C.).

It was organized, as were the professional armies, on the accepted model of the old armies, viz. the phalangite order, but the addition of peltasts now made a Theban army, unlike the Spartans, capable of operating in broken country as well as in the plain. The new tactics of the phalanx, introduced by Epaminondas, embodied, for the first time in the history of war, the modern principle of local superiority of force, and suggested to Frederick the Great the famous "oblique order of battle." Further, the cavalry was more numerous and better led than that of Peloponnesian states. The professional armies had well understood the management of cavalry; Xenophon's handbook of the subject is not without value in the 20th century. In Greek armies the dearth of horses and the consequent numerical weakness of the cavalry prevented the bold use of the arm on the battlefield (see CAVALRY). But Thebes had always to deal with nations which possessed numerous horsemen. Jason of Pherae, for instance, put into the field against Thebes many thousands of Thessalian horse; and thus at the battle of Tegyra in 375 the Theban cavalry under Pelopidas, aided by the *corps d'élite* of infantry called the Sacred Band, carried all before them. At Leuctra Epaminondas won a glorious victory by the use of his "oblique order" tactics; the same methods achieved the second great victory of Mantineia (362 B.c.) at which Epaminondas fell. Pelopidas had already been slain in a battle against the Thessalians, and there was no leader to carry on their work. But the new Greek system was yet to gain its greatest triumphs under Alexander the Great.

7. *Alexander.*—The reforms of Alexander's father, Philip of Macedon, may most justly be compared to those of Frederick William I. in Prussia. Philip had lived at Thebes as a hostage, and had known Iphicrates, Epaminondas and Pelopidas. He grafted the Theban system of tactics on to

the Macedonian system of organization. That the latter—a complete territorial system—was efficient was shown by the fact that Philip's blow was always struck before his enemies were ready to meet it. That the new Greek tactics, properly used, were superior to the old was once more demonstrated at Chaeronea (338 B.C.), where the Macedonian infantry militia fought in phalanx, and the cavalry, led by the young Alexander, delivered the last crushing blow. On his accession, like Frederick the Great, Alexander inherited a well-trained and numerous army, and was not slow to use it. The invasion of Asia was carried out by an army of the Greek pattern, formed both of Hellenes and of non-Hellenes on an exceedingly strong Macedonian nucleus. Alexander's own guard was composed of picked horse and foot. The infantry of the line comprised Macedonian and Greek hoplites, the Macedonians being subdivided into heavy and medium troops. These fought in a grand phalanx, which was subdivided into units corresponding to the modern divisions, brigades and regiments, the fighting formation being normally a line of battalion masses. The arm of the infantry was the 18-foot pike (*sarissa*). The peltasts, Macedonian and Greek, were numerous and well trained, and there was the usual mass of irregular light troops, bowmen, slingers, &c. The cavalry included the Guard (ἄγημα), a body of heavy cavalry composed of chosen Macedonians, the line cavalry of Macedonia (ἑταῖροι) and Thessaly, the numerous small contingents of the Greek states, mercenary corps and light lancers for outpost work. The final blow and the gathering of the fruits of victory were now for the first time the work of the mounted arm. The solid phalanx was almost unbreakable in the earlier stages of the battle, but after a long infantry fight the horsemen had their chance. In former wars they were too few and too poorly mounted to avail themselves of it, and decisive victories were in consequence rarely achieved in battles of Greek versus Greek. Under Epaminondas, and still more under Philip and Alexander, the cavalry was strong enough for its new work. Battles are now ended by the shock action

of mounted men, and in Alexander's time it is noted as a novelty that the cavalry carried out the pursuit of a beaten army. There were further, in Alexander's army, artillerymen with a battering train, engineers and departmental troops, and also a medical service, an improvement attributed to Jason of Pherae. The victories of this army, in close order and in open, over every kind of enemy and on every sort of terrain, produced the Hellenistic world, and in that achievement the history of Greek armies closes, for after the return of the greater part of the Europeans to their homes the armies of Alexander and his successors, while preserving much of the old form, become more and more orientalized.

The decisive step was taken in 323, when a picked contingent of Persians, armed mainly with missile weapons, was drafted into the phalanx, in which henceforward they formed the middle ranks of each file of sixteen men. But, like the third rank of Prussian infantry up to 1888, they normally fought as skirmishers in advance, falling into their place behind the pikes of the Macedonian file-leaders only if required for the decisive assault. The new method, of course, depended for success on the steadiness of the thin three-deep line of Macedonians thus left as the line of battle. Alexander's veterans were indeed to be trusted, but as time went on, and little by little the war-trained Greeks left the service, it became less and less safe to array the Hellenistic army in this shallow and articulated order of battle. The purely formal organization of the phalanx sixteen deep became thus the actual tactical formation, and around this solid mass of 16,384 men gathered the heterogeneous levies of a typical oriental army. Pyrrhus, king of Epirus, retained far more of the tradition of Alexander's system than his contemporaries farther east, yet his phalanx, comparatively light and mobile as it was, achieved victories over the Roman legion only at the cost of self-destruction. Even elephants quickly became a necessary adjunct to Hellenistic armies.

8. *Carthage.*—The military systems of the Jews present few features of unusual interest. The expedient of calling out successive contingents from the different tribes, in order to ensure continuity in military operations, should, however, be noticed. David and Solomon possessed numerous permanent troops which served as guards and garrisons; in principle this organization was identical with that of the Persians, and that of Europe in the 16th and 17th centuries. Particular interest attaches to the Carthaginian military forces of the 3rd century B.C. Rarely has any army achieved such renown in the short space of sixty years (264-202 B.C.). Carthage produced a series of great generals, culminating in Hannibal, who is marked out, even by the little that is known of him, as the equal of Napoleon. But Napoleon was supported by a national army, Hannibal and his predecessors were condemned to work with armies of mercenaries. For the first time in the world's history war is a matter with which the civil population has no concern. The merchants of Carthage fought only in the last extremity; the wars in which their markets were extended were conducted by non-national forces and directed by the few Carthaginian citizens who possessed military aptitudes. The civil authorities displayed towards their instruments a spirit of hatred for which it is difficult to find a parallel. Unsuccessful leaders were crucified, the mercenary soldiers were cheated of their pay, and broke out into a mutiny which shook the empire of Carthage to its foundations. But the magnetism of a leader's personality infused a corporate military spirit into these heterogeneous Punic armies, and history has never witnessed so complete an illustration of the power of pure and unaided *esprit de corps* as in the case of Hannibal's army in Italy, which, composed as it was of Spaniards, Africans, Gauls, Numidians, Italians and soldiers of fortune of every country, was yet welded by him into thorough efficiency. The army of Italy was as great in its last fight at Zama as the army of Spain at Rocroi; its victories of the Trebia, Trasimene and Cannae were so

appalling that, two hundred years later, the leader to whom these soldiers devoted their lives was still, to a Roman, the "dire" Hannibal.

In their formal organization the Carthaginian armies resembled the new Greek model, and indeed they were created in the first instance by Xanthippus, a Spartan soldier in the service of Carthage, who was called upon to raise and train an army when the Romans were actually at the gates of Carthage, and justified his methods in the brilliant victory of Tunis (255 B.C.). For the solid Macedonian phalanx of 16,000 spears Xanthippus substituted a line of heavy battalions equal in its aggregate power of resistance to the older form, and far more flexible. The triumphs of the cavalry arm in Hannibal's battles far excelled those of Alexander's horsemen. Hannibal chose his fighting ground whenever possible with a view to using their full power, first to defeat the hostile cavalry, then to ride down the shaken infantry masses, and finally to pursue *au fond*. At Cannae, the greatest disaster ever suffered by the Romans, the decisive blow and the slaughter were the work of Hannibal's line cavalry, the relentless pursuit that of his light horse. But a professional long-service army has always the greatest difficulty in making good its losses, and in the present case it was wholly unable to do so. Even Hannibal failed at last before the sustained efforts of the citizen army of Rome.

9. *Roman Army under the Republic.*—The earliest organization of the Roman army is attributed to Romulus, who formed it on the tribal principle, each of the three tribes contributing its contingent of horse and foot. But it was to Servius Tullius that Rome owed, traditionally, the complete classification of her citizen-soldiers. For the details of the Roman military system, see ROMAN ARMY. During the earlier period of Roman history the army was drawn entirely from the first classes of the population, who served without pay and provided their own arms and armour. The wealthiest men (*equites*) furnished the cavalry, the remainder the infantry, while the

poorer classes either fought as light troops or escaped altogether the privilege and burden of military service. Each "legion" of 3000 heavy foot was at first formed in a solid phalanx. The introduction of the elastic and handy three-line formation with intervals (similar in many respects to Alexander's) was brought about by the Gallic wars, and is attributed to M. Furius Camillus, who also, during the siege of Veii, introduced the practice of paying the soldiers, and thus removed the chief obstacle to the employment of the poorer classes. The new order of battle was fully developed in the Pyrrhic Wars, and the typical army of the Republic may be taken as dating from the latter part of the 3rd century B.C. The legionary was still possessed of a property qualification, but it had become relatively small. An annual levy was made at Rome to provide for the campaign of the year. Discipline was severe, and the rewards appealed as much to the soldier's honour as to his desire of gain. A legion now consisted of three lines (*Hastati, Principes, Triarii*), each line composed of men of similar age and experience, and was further subdivided into thirty "maniples," each of two "centuries." The normal establishment of 300 cavalry, 3000 heavy and 1200 light infantry was still maintained, though in practice these figures were often exceeded. In place of the old light-armed and somewhat inferior *rorarii*, the new *velites* performed light infantry duties (211 B.C.), at the same time retaining their place in the maniples, of which they formed the last ranks (compare the Macedonian phalanx as reorganized in 323, § 7 above). The 300 cavalry of the legion were trained for shock action. But the strength of the Roman army lay in the heavy legionary infantry of citizens. The thirty maniples of each legion stood in three lines of battle, but the most notable point of their formation was that each maniple stood by itself on its own small manœuvre-area, free to take ground to front or flank. To the Roman legion was added a legion of allies, somewhat differently organized and possessing more cavalry, and the whole force was called a "double legion" or briefly a "legion." A consul's army consisted nominally

of two double legions, but in the Punic wars military exigencies rather than custom dictated the numbers of the army, and the two consuls at Cannae (216 B.C.) commanded two double consular armies, or eight double legions.

10. *Characteristics of the Roman Army.*—Such in outline was the Roman military organization at the time when it was put to the severe test of the Second Punic War. Its elements were good, its military skill superior to that of any other army of ancient history, while its organization was on the whole far better than any that had gone before. The handy formation of maniples at open order was unique in the ancient world, and it did not reappear in history up to the advent of Gustavus Adolphus. In this formation, in which everything was entrusted to the skill of subordinates and the individual courage of the rank and file, the Romans met and withstood with success every type of impact, from the ponderous shock of the Macedonian phalanx and the dangerous rush of Celtic savages to the charge of elephants. Yet it was no particular virtue in the actual form employed that carried the Roman arms to so many victories. There would have been positive danger in thus articulating the legion had it been composed of any but the most trustworthy soldiers. To swiftness and precision of manœuvre they added a dogged obstinacy over which nothing but overwhelming disaster prevailed. It is, therefore, not unnatural to ask wherein the system which produced these soldiers failed, as it did within a century after the battle of Zama. The greatest defect was the want of a single military command. The civil magistrates of Rome were *ex officio* leaders of her armies, and though no Roman officer lacked military training, the views of a consul or praetor were almost invariably influenced by the programme of his political party. When, as sometimes happened, the men under their command sided in the political differences of their leaders, all real control came to an end. The soldiers of the Republic hardly ever forgot that they were citizens with voting powers; they served as a rule only during a campaign; and, while there could be little question as to their patriotism

and stubbornness, they lacked almost entirely that *esprit de corps* which is found only amongst the members of a body having a permanent corporate existence. Thus they had the vices as well as the virtues of a nation in arms, and they fell still further short of the ideal because of the dubious and precarious tenure of their generals' commands. The great officers were usually sent home at the end of a campaign, to be replaced by their elected successors, and they showed all the hesitation and fear of responsibility usually found in a temporary commander. Above all, when two armies, each under its own consul or praetor, acted together, the command was either divided or exercised on alternate days.

11. *Roman Empire.*—The essential weaknesses of militia forces and the accidental circumstances of that under consideration led, even in earlier times, to the adoption of various expedients which for a time obviated the evils to which allusion has been made. But a change of far greater importance followed the final exploits of the armies of the old system. The increasing dominions of the Republic, the spread of wealth and luxury, the gradual decadence of the old Roman ideas, all tended to produce an army more suited to the needs of the newer time than the citizen militia of the 3rd century. Permanent troops were a necessity; the rich, in their newly acquired dislike of personal effort, ceased to bear their share in the routine life of the army, and thus the proletariat began to join the legions with the express intention of taking to a military career. The actual change from the old *régime* to the new was in the main the work of Gaius Marius. The urgent demand for men at the time of the Teutonic invasions caused the service to be thrown open to all Roman citizens irrespective of *census*. The new territories furnished cavalry, better and more numerous than the old *equites*, and light troops of various kinds to replace the *velites*. Only the heavy foot remained a purely Italian force, and the spread of the Roman citizenship gradually abolished the distinction between a Roman and an allied legion. The higher classes had repeatedly shown themselves

unwilling to serve under plebeians (*e.g.* Varro and Flaminius); Marius preferred to have as soldiers men who did not despise him as an inferior. Under all these influences for good or for evil, the standing army was developed in the first half of the 1st century B.C. The tactical changes in the legion indicate its altered character. The small maniples gave way to heavy "cohorts," ten cohorts forming the legion; as in the Napoleonic wars, light and handy formations became denser and more rigid with the progressive decadence in *moral* of the rank and file. It is more significant still that in the days of Marius the annual oath of allegiance taken by the soldier came to be replaced by a personal vow, taken once and for all, of loyalty to the general. *Ubi bene, ibi patria* was an expression of the new spirit of the army, and Caesar had but to address his men as *quirites* (civilians) to quell a mutiny. *Hastati, principes* and *triarii* were now merely expressions in drill and tactics. But perhaps the most important of all these changes was the growth of regimental spirit and tradition. The legions were now numbered throughout the army, and the Tenth Legion has remained a classic instance of a "crack" corps. The *moral* of the Roman army was founded no longer on patriotism, but on professional pride and *esprit de corps*.

With this military system Rome passed through the era of the Civil Wars, at the end of which Augustus found himself with forty-five legions on his hands. As soon as possible he carried through a great reorganization, by which, after ruthlessly rejecting inferior elements, he obtained a smaller picked force of twenty-five legions, with numerous auxiliary forces. These were permanently stationed in the frontier provinces of the Empire, while Italy was garrisoned by the Praetorian cohorts, and thus was formed a regular long-service army, the strength of which has been estimated at 300,000 men. But these measures, temporarily successful, produced in the end an army which not only was perpetually at variance with the civil populations it was supposed to protect, but frequently murdered the emperors to whom it had sworn allegiance when it raised them to the

throne. The evil fame of the Italian cohorts has survived in the phrase "praetorianism" used to imply a venal military despotism. The citizens gradually ceased to bear arms, and the practice of self-mutilation became common. The inevitable *dénouement* was delayed from time to time by the work of an energetic prince. But the ever-increasing inefficiency and factiousness of the legions, and the evanescence of all military spirit in the civil population, made it easy for the barbarians, when once the frontier was broken through, to overrun the decadent Empire. The end came when the Gothic heavy horse annihilated the legions of Valens at Adrianople (A.D. 378).

There was now no resource but to take the barbarians into Roman pay. Under the name of *foederati*, the Gothic mercenary cavalry played the most conspicuous part in the succeeding wars of the Empire, and began the reign of the heavy cavalry arm, which lasted for almost a thousand years. Even so soon as within six years of the death of Valens twenty thousand Gothic horse decided a great battle in the emperor's favour. These men, however, became turbulent and factious, and it was not until the emperor Leo I. had regenerated the native Roman soldier that the balance was maintained between the national and the hired warrior. The work of this emperor and of his successors found eventual expression in the victories of Belisarius and Narses, in which the Romans, in the new role of horse-archers, so well combined their efforts with those of the *foederati* that neither the heavy cavalry of the Goths nor the phalanx of Frankish infantry proved to be capable of resisting the imperial forces. At the battle of Casilinum (553) Roman foot-archers and infantry bore no small part of the work. It was thus in the Eastern Empire that the Roman military spirit revived, and the Byzantine army, as evolved from the system of Justinian, became eventually the sole example of a fully organized service to be found in medieval history.

12. *The "Dark Ages."*—In western Europe all traces of Roman military institutions quickly died out, and the conquerors of the new kingdoms developed fresh systems from the simple tribal levy. The men of the plains were horsemen, those of marsh and moor were foot, and the four greater peoples retained these original characteristics long after the conquest had been completed. In organization the Lombards and Franks, Visigoths and English scarcely differed. The whole military population formed the mass of the army, the chiefs and their personal retainers the *élite*. The Lombards and the Visigoths were naturally cavalry; the Franks and the English were, equally naturally, infantry, and the armies of the Merovingian kings differed but little from the English *fyrd* with which Offa and Penda fought their battles. But in these nations the use of horses and armour, at first confined to kings and great chiefs, gradually spread downwards to the ever-growing classes of *thegns, comites*, &c. Finally, under Charlemagne were developed the general lines of the military organization which eventually became feudalism. For his distant wars he required an efficient and mobile army. Hence successive "capitularies" were issued dealing with matters of recruiting, organization, discipline and field service work. Very noticeable are his system of forts (*burgi*) with garrisons, his military train of artillery and supplies, and the reappearance of the ancient principle that three or four men should equip and maintain one of themselves as a warrior. These and other measures taken by him tended to produce a strong veteran army, very different in efficiency from the tumultuary levy, to which recourse was had only in the last resort. While war (as a whole) was not yet an art, fighting (from the individual's point of view) had certainly become a special function; after Charlemagne's time the typical feudal army, composed of well-equipped cavalry and ill-armed peasantry serving on foot, rapidly developed. Enemies such as Danes and Magyars could only be dealt with by mounted men who could ride round them, compel them to fight, and annihilate them by the shock of the charge; consequently the practice of

leaving the infantry in rear, and even at home, grew up almost as a part of the feudal system of warfare. England, however, sought a different remedy, and thus diverged from the continental methods. This remedy was the creation of a fleet, and, the later Danish wars being there carried out, not by bands of mounted raiders, but by large armies of military settlers, infantry retained its premier position in England up to the day of Hastings. Even the *thegns*, who there, as abroad, were the mainstay of the army, were heavy-armed infantry. The only contribution made by Canute to the military organization of England was the retention of a picked force of *hus carles* (household troops) when the rest of the army with which he had conquered his realm was sent back to Scandinavia. At Hastings, the forces of Harold consisted wholly of infantry. The English array was composed of the king and his personal friends, the *hus carles*, and the contingents of the *fyrd* under the local *thegns*; though better armed, they were organized after the manner of their forefathers. On that field there perished the best infantry in Europe, and henceforward for three centuries there was no serious rival to challenge the predominance of the heavy cavalry.

13. *The Byzantines* (cf. article ROMAN EMPIRE, LATER).—While the west of Europe was evolving feudalism, the Byzantine empire was acquiring an army and military system scarcely surpassed by any of those of antiquity and not often equalled up to the most modern times. The *foederati* disappeared after the time of Justinian, and by A.D. 600 the army had become at once professional and national. For generations, regiments had had a corporate existence. Now brigades and divisions also appeared in war, and, somewhat later, in peace likewise. With the disappearance of the barbarians, the army became one homogeneous service, minutely systematized, and generally resembling an army in the modern sense of the word. The militia of the frontier districts performed efficiently the service of surveillance, and the field forces of disciplined regulars were moved and employed in accordance with well-reasoned principles of war; their

maintenance was provided for by a scutage, levied, in lieu of service, on the central provinces of the empire. Later, a complete territorial system of recruiting and command was introduced. Each “theme” (military district) had its own regular garrison, and furnished a field division of some 5000 picked troopers for a campaign in any theatre of war. Provision having been made in peace for a depot system, all weakly men and horses could be left behind, and local duties handed over to second line troops; thus the field forces were practically always on a war footing. Beside the “themes” under their generals, there were certain districts on the frontiers, called “clissuras,” placed under chosen officers, and specially organized for emergency service. The corps of officers in the Byzantine army was recruited from the highest classes, and there were many families (*e.g.* that from which came the celebrated Nicephorus Phocas) in which soldiering was the traditional career. The rank and file were either military settlers or men of the yeoman class, and in either case had a personal interest in the safety of the theme which prevented friction between soldiers and civilians. The principal arm was, of course, cavalry, and infantry was employed only in special duties. Engineer, train and medical services were maintained in each theme. Of the ensemble of the Byzantine army it has been said that “the art of war as it was understood at Constantinople ... was the only system of real merit existing. No western nation could have afforded such a training to its officers till the 16th or ... 17th century.” The vitality of such an army remained intact long after the rest of the empire had begun to decay, and though the old army practically ceased to exist after the great disaster of Manzikert (1071), the barbarians and other mercenaries who formed the new service were organized, drilled and trained to the same pitch of military efficiency. Indeed the greatest tactical triumph of the Byzantine system (Calavryta, 1079) was won by an army already largely composed of foreigners. But mercenaries in the end developed

praetorianism, as usual, and at last they actually mutinied, in the presence of the enemy, for higher pay (Constantinople, 1204).

14. *Feudalism.*—From the military point of view the change under feudalism was very remarkable. For the first time in the history of western Europe there appears, in however rough a form, a systematized obligation to serve in arms, regulated on a territorial basis. That army organization in the modern sense—organization for tactics and command—did not develop in any degree commensurate with the development of military administration, was due to the peculiar characteristics of the feudal system, and the virtues and weaknesses of medieval armies were its natural outcome. Personal bravery, the primary virtue of the soldier, could not be wanting in the members of a military class, the *métier* of which was war and manly exercises. Pride of caste, ambition and knightly emulation, all helped to raise to a high standard the individual efficiency of the feudal cavalier. But the gravest faults of the system, considered as an army organization, were directly due to this personal element. Indiscipline, impatience of superior control, and dangerous knight-errantry, together with the absence of any chain of command, prevented the feudal cavalry from achieving results at all proportionate to the effort expended and the potentialities of a force with so many soldierly qualities. If such defects were habitually found in the best elements of the army—the feudal tenants and subtenants who formed the heavy cavalry arm—little could be expected of the despised and ill-armed foot-soldiery of the levy. The swift raids of the Danes and others (see above) had created a precedent which in French and German wars was almost invariably followed. The feudal levy rarely appeared at all on the battlefield, and when it was thus employed it was ridden down by the hostile knights, and even by those of its own party, without offering more than the feeblest resistance. Above all, one disadvantage, common to all classes of feudal soldiers, made an army so composed quite untrustworthy. The service which a king was able to exact

from his feudatories was so slight (varying from one month to three in the year) that no military operation which was at all likely to be prolonged could be undertaken with any hope of success.

15. *Medieval Mercenaries.*—It was natural, therefore, that a sovereign who contemplated a great war should employ mercenaries. These were usually foreigners, as practically all national forces served on feudal terms. While the greater lords rode with him on all his expeditions, the bulk of his army consisted of professional soldiers, paid by the levy of *scutage* imposed upon the feudal tenantry. There had always been soldiers of fortune. William's host at Hastings contained many such men; later, the Flemings who invaded England in the days of Henry I. sang to each other—

"Hop, hop, Willeken, hop! England is mine and thine,"—

and from all the evidence it is clear that in earlier days the hired soldiers were adventurers seeking lands and homes. But these men usually proved to be most undesirable subjects, and sovereigns soon began to pay a money wage for the services of mercenaries properly so called. Such were the troops which figured in English history under Stephen. Such troops, moreover, formed the main part of the armies of the early Plantagenets. They were, as a matter of course, armed and armoured like the knights, with whom they formed the men-at-arms (*gendarmes*) of the army. Indeed, in the 11th and 12th centuries, the typical army of France or the Empire contains a relatively small percentage of "knights," evidence of which fact may be found even in so fanciful a romance as *Aucassin and Nicolete*. It must be noted, however, that not all the mercenaries were heavy cavalry; the Brabançon pikeman and the Italian crossbowman (the value of whose weapon was universally recognized) often formed part of a feudal army.

16. *Infantry in Feudal Times.*—These mercenary foot soldiers came as a rule from districts in which the infantry arm had maintained its ancient

predominance in unbroken continuity. The cities of Flanders and Brabant, and those of the Lombard plain, had escaped feudal interference with their methods of fighting, and their burgher militia had developed into solid bodies of heavy-armed pikemen. These were very different from those of the feudal levy, and individual knightly bravery usually failed to make the slightest impression on a band of infantry held together by the stringent corporate feeling of a trade-gild. The more adventurous of the young men, like those of the Greek cities, took service abroad and fought with credit in their customary manner. The reign of the "Brabançon" as a mercenary was indeed short, but he continued, in his own country, to fight in the old way, and his successor in the profession of arms, the Genoese crossbowman, was always highly valued. In England, moreover, the infantry of the old *fyrd* was not suffered to decay into a rabble of half-armed countrymen, and in France a burgher infantry was established by Louis VI. under the name of the *milice des communes*, with the idea of creating a counterpoise to the power of the feudatories. Feudalism, therefore, as a military system, was short-lived. Its limitations had always necessitated the employment of mercenaries, and in several places a solid infantry was coming into existence, which was drawn from the sturdy and self-respecting middle classes, and in a few generations was to prove itself a worthy opponent not only to the knight, but to the professional man-at-arms.

17. *The Crusades.*—It is an undoubted fact that the long wars of the Crusades produced, directly, but slight improvement in the feudal armies of Europe. In the East large bodies of men were successfully kept under arms for a considerable period, but the application of crusading methods to European war was altogether impracticable. In the first place, much of the permanent force of these armies was contributed by the military orders, which had no place in European political activities. Secondly, enthusiasm mitigated much of the evil of individualism. In the third place, there was no custom to limit the period of service, since the Crusaders had undertaken a

definite task and would merely have stultified their own purpose in leaving the work only half done. There were, therefore, sharp contrasts between crusading and European armies. In the latter, systematization was confined to details of recruiting; in the armies of the Cross, men were from time to time obtained by the accident of religious fervour, while at the same time continuous service produced a relatively high system of tactical organization. Different conditions, therefore, produced different methods, and crusading unity and discipline could not have been imposed on an ordinary army, which indeed with its paid auxiliaries was fairly adequate for the somewhat desultory European wars of that time. The statement that the Crusaders had a direct influence on the revival of infantry is hardly susceptible of convincing demonstration, but it is at any rate beyond question that the social and economic results of the Crusades materially contributed to the downfall of the feudal knight, and in consequence to a rise in the relative importance of the middle classes. Further, not only were the Crusading knights compelled by their own want of numbers to rely on the good qualities of the foot, but the foot themselves were the "survivors of the fittest," for the weakly men died before they reached the Holy Land, and with them there were always knights who had lost their horses and could not obtain remounts. Moreover, when "simple" and "gentle" both took the Cross there could be no question of treating Crusaders as if they were the mere feudal levy. But the little direct influence of the whole of these wars upon military progress in Europe is shown clearly enough by the fact that at the very close of the Crusades a great battle was lost through knight-errantry of the true feudal type (Mansurah).

18. *The Period of Transition* (1290-1490).—Besides the infantry already mentioned, that of Scotland and that of the German cities fought with credit on many fields. Their arm was the pike, and they were always formed in solid masses (called in Scotland, *schiltrons*). The basis of the medieval commune being the suppression of the individual in the social unit, it was

natural that the burgher infantry should fight “in serried ranks and in better order” than a line of individual knights, who, moreover, were almost powerless before walled cities. But these forces lacked offensive power, and it was left for the English archers, whose importance dates from the latter years of the 13th century, to show afresh, at Creçy, Poitiers and Agincourt, the value of missile action. When properly supported by other arms, they proved themselves capable of meeting both the man-at-arms and the pikeman. The greatest importance attaches to the evolution of this idea of mutual support and combination. Once it was realized, war became an art, and armies became specially organized bodies of troops of different arms. It cannot be admitted, indeed, as has been claimed, that the 14th century had a scientific system of tactics, or that the campaign of Poitiers was arranged by the French “general staff.” Nevertheless, during this century armies were steadily coming to consist of expert soldiers, to the exclusion of national levies and casual mercenaries. It is true that, by his system of “indents,” Edward III. of England raised national armies of a professional type, but the English soldier thus enrolled, when discharged by his own sovereign, naturally sought similar employment elsewhere. This system produced, moreover, a class of unemployed soldiers, and these, with others who became adventurers from choice or necessity, and even with foreign troops, formed the armies which fought in the Wars of the Roses—armies which differed but slightly from others of the time. The natural result of these wars was to implant a hatred of soldiery in the heart of a nation which had formerly produced the best fighting men in Europe, a hatred which left a deep imprint on the constitutional and social life of the people. In France, where Joan of Arc passed like a meteor across the military firmament, the idea of a national regular army took a practical form in the middle of the 15th century. Still, the forces thus brought into existence were not numerous, and the soldier of fortune, in spite of such experiences of his

methods as those of the Wars of the Roses, was yet to attain the zenith of his career.

19. *The Condottieri.*—The immediate result of this confused period of destruction and reconstruction was the *condottiere*, who becomes important about 1300. In Italy, where the *condottieri* chiefly flourished, they were in demand owing to the want of feudal cavalry, and the inability of burgher infantry to undertake wars of aggression. The "free companies" (who served in great numbers in France and Spain as well as in Italy) were "military societies very much like trade-gilds," which (so to speak) were hawked from place to place by their managing directors, and hired temporarily by princes who needed their services. Unlike the older hirelings, they were permanently organized, and thus, with their experience and discipline, became the best troops in existence. But the carrying on of war "in the spirit of a handicraft" led to bloodless battles, indecisive campaigns, and other unsatisfactory results, and the reign of the *condottieri* proper was over by 1400, subsequent free companies being raised on a more strictly national basis. With all their defects, however, they were the pioneers of modern organization. In the inextricable tangle of old and new methods which constitutes the military system of the 15th century, it is possible to discern three marked tendencies. One is the result of a purely military conception of the now special art of war, and its exposition as an art by men who devote their whole career to it. The second is the idea of a national army, resulting from many social, economical and political causes. The third is the tendency towards minuter organization and subdivision within the army. Whereas the individual feudatories had disliked the close supervision of a minor commander, and their army had in consequence remained always a loosely-knit unit, the men who made war into an art belonged to small bands or corps, and naturally began their organization from the lower units. Herein, therefore, was the germ of the regimental system of the present day.

20. *The Swiss.*—The best description of a typical European army at the opening of the new period of development is that of the French army in Italy in 1494, written by Paolo Giovio. He notes with surprise that the various corps of infantry and cavalry are distinct, the usual practice of the time being to combine one lancer, one archer, one groom, &c., into a small unit furnished and commanded by the lancer. There were Swiss and German infantry, armed with pike and halbert, with a few "shot," who marched in good order to music. There were the heavy men-at-arms (*gendarmes*), accompanied as of old by mounted archers, who, however, now fought independently. There were, further, Gascon slingers and crossbowmen, who had probably acquired, from contact with Spain, some of the lightness and dash of their neighbours. The artillery train was composed of 140 heavy pieces and a great number of lighter guns; these were then and for many generations thereafter a special arm outside the military establishments (see ARTILLERY). In all this the only relic of the days of Creçy is the administrative combination of the men-at-arms and the horse archers, and even this is no longer practised in action. The most important element in the army is the heavy infantry of Swiss and Germans. The Swiss had for a century past gradually developed into the most formidable troops of the day. The wars of Žižka (*q.v.*) in Bohemia (1420) materially assisted in the downfall of the heavy cavalry; and the victories of the Swiss, beginning with Sempach (1382), had by 1480 proved that their solid battalions, armed with the long pike and the halberd, were practically invulnerable to all but missile and shock action combined. By fortune of war, they never met the English, who had shown the way to deal with the *schiltron* as early as Falkirk. So great was their confidence against ordinary troops, that on one occasion (1444) they detached 1600 men to engage 50,000. It was natural that a series of victories such as Granson, Morat and Nancy should place them in the forefront of the military nations of Europe. The whole people devoted itself thereupon to professional soldiering, particularly in the

French service, and though their monopoly of mercenary employment lasted a short time only, they continued to furnish regiments to the armies of France, Spain and the Pope up to the most modern times. But their efficiency was thoroughly sapped by the growth of a mutinous and insubordinate spirit, the memory of which has survived in the proverb *Point d'argent, point de Suisse*, and inspired Machiavelli with the hatred of mercenaries which marks every page of his work on the art of war. One of their devices for extorting money was to appear at the muster with many more soldiers than had been contracted for by their employers, who were forced to submit to this form of blackmail. At last the French, tired of these caprices, inflicted on the Swiss the crushing defeat of Marignan (*q.v.*), and their tactical system received its death-blow from the Spaniards at Pavia (1525).

21. *The Landsknechts.*—The modern army owes far more of its organization and administrative methods to the Landsknechts ("men of the country," as distinct from foreigners) than to the Swiss. As the latter were traditionally the friends of France, so these Swabians were the mainstay of the Imperial armies, though both were mercenaries. The emperor Maximilian exerted himself to improve the new force, which soon became the model for military Europe. A corps of Landsknechts was usually raised by a system resembling that of "indents," commissions being issued by the sovereign to leaders of repute to enlist men. A "colour" (*Fähnlein*) numbered usually about 400 men, a corps consisted of a varying number of colours, some corps having 12,000 men. From these troops, with their intense pride, *esprit de corps* and comradeship, there has come down to modern times much of present-day etiquette, interior economy and "regimental customs"—in other words, nearly all that is comprised in the "regimental" system. Amongst the most notable features of their system were the functions of the provost, who combined the modern offices of provost-marshal, transport and supply officer, and canteen manager; the

disciplinary code, which admitted the right of the rank and file to judge offences touching the honour of the regiment; and the women who, lawfully or unlawfully attached to the soldiers, marched with the regiment and had a definite place in its corporate life. The conception of the regiment as the home of the soldier was thus realized in fact.

22. *The Spanish Army.*—The tendencies towards professional soldiering and towards subdivision had now pronounced themselves. At the same time, while national armies, as dreamed of by Machiavelli; were not yet in existence, two at least of the powers were beginning to work towards an ideal. This ideal was an army which was entirely at the disposal of its own sovereign, trained to the due professional standard, and organized in the best way found by experience to be applicable to military needs. On these bases was formed the old Spanish army which, from Pavia (1525) to Rocroi (1643), was held by common consent to be the finest service in existence. Almost immediately after emerging from the period of internal development, Spain found herself obliged to maintain an army for the Italian wars. In the first instance this was raised from amongst veterans of the war of Granada, who enlisted for an indefinite time. Probably the oldest line regiments in Europe are those descended from the famous *tercios*, whose formation marks the beginning of military establishments, just as the Landsknechts were the founders of military manners and customs. The great captains who led the new army soon assimilated the best points of the Swiss system, and it was the Spanish army which evolved the typical combination of pike and musket which flourished up to 1700. Outside the domain the tactics, it must be credited with an important contribution to the science of army organization, in the depot system, whereby the *tercios* in the field were continually “fed” and kept up to strength. The social position of the soldier was that of a gentleman, and the young nobles (who soon came to prefer the *tercios* to the cavalry service) thought it no shame, when their commands were reduced, to “take a pike” in another regiment. The

provost and his gallows were as much in evidence in a Spanish camp as in one of Landsknechts, but the comradeship and *esprit de corps* of a *tercio* were the admiration of all contemporary soldiers. With all its good qualities, however, this army was not truly national; men soon came from all the various nations ruled by the Habsburgs, and the soldier of fortune found employment in a *tercio* as readily as elsewhere. But it was a great gain that corps, as such, were fully recognized as belonging to the government, however shifting the *personnel* might be. Permanence of regimental existence had now been attained, though the universal acceptance and thorough application of the principle were still far distant. During the 16th century, the French regular army (originating in the *compagnies d'ordonnance* of 1445), which was always in existence, even when the Swiss and *gendarmes* were the best part of the field forces, underwent a considerable development, producing amongst other things the military terminology of the present day. But the wars of religion effectually checked all progress in the latter part of the century, and the European reputation of the French army dates only from the latter part of the Thirty Years' War.

23. *The Sixteenth Century.*—The battle of St Quentin (1557) is usually taken as the date from which the last type of a purely mercenary *arm* (as distinct from *corps*) comes into prominence. "Brabançon" or "Swiss" implied pikemen without further qualification, the new term "Reiter" similarly implied mercenary cavalry fighting with the pistol. Heavy cavalry could disperse arquebusiers and musketeers, but it was helpless against solid masses of pikemen; the Reiters solved the difficulty by the use of the pistol. They were well armoured and had little to fear from musket-balls. Arrayed in deep squadrons, therefore, they rode up to the pikes with impunity, and fired methodically *dans le tas*, each rank when it had discharged its pistols filing to the rear to reload. These Reiters were organized in squadrons of variable strength, and recruited in the same manner as were the Landsknechts. They were much inferior, however, to

the latter in their discipline and general conduct, for cavalry had many more individual opportunities of plunder than the foot, and the rapacity and selfishness of the Reiters were consequently in marked contrast to the good order and mutual helpfulness in the field and in quarters which characterized the regimental system of the Landsknechts.

24. *Dutch System.*—The most interesting feature of the Dutch system, which was gradually evolved by the patriots in the long War of Independence, was its minute attention to detail. In the first years of the war, William the Silent had to depend, for field operations, on mutinous and inefficient mercenaries and on raw countrymen who had nothing but devotion to oppose to the discipline and skill of the best regular army in the world. Such troops were, from the point of view of soldiers like Alva, mere *canaille*, and the ludicrous ease with which their armies were destroyed (as at Jemmingen and Mookerheyde), at the cost of the lives of perhaps a dozen Spanish veterans, went far to justify this view. But, fortunately for the Dutch, their fortified towns were exceedingly numerous, and the individual bravery of citizen-militia, who were fighting for the lives of every soul within their walls, baffled time after time all the efforts of Alva's men. In the open, Spanish officers took incredible liberties with the enemy; once, at any rate, they marched for hours together along submerged embankments with hostile vessels firing into them from either side. Behind walls the Dutch were practically a match for the most furious valour of the assailants.

The insurgents' first important victory in the open field, that of Rymenant near Malines (1577), was won by the skill of "Bras de Fer," de la Noue, a veteran French general, and the stubbornness of the English contingent of the Dutch army—for England, from 1572 onwards, sent out an ever-increasing number of volunteers. This battle was soon followed by the great defeat of Gembloux (1578), and William the Silent was not destined to see the rise of the Dutch army. Maurice of Nassau was the real organizer of

victory. In the wreck of all feudal and burgher military institutions, he turned to the old models of Xenophon, Polybius, Aelian and the rest. Drill, as rigid and as complicated as that of the Macedonian phalanx, came into vogue, the infantry was organized more strictly into companies and regiments, the cavalry into troops or cornets. The *Reiter* tactics of the pistol were followed by the latter, the former consisted of pikes, halberts and "shot." This form was generally followed in central Europe, as usual, without the spirit, but in Holland it was the greater trustworthiness of the rank and file that allowed of more flexible formations, and here we no longer see the foot of an army drawn up, as at Jemmingen, in one solid and immovable "square." In their own country and with the system best suited thereto, the Dutch, who moreover acquired greater skill and steadiness day by day, maintained their ground against all the efforts of a Parma and a Spinola. Indeed, it is the best tribute to the vitality of the Spanish system that the inevitable *débâcle* was so long delayed. The campaigns of Spinola in Germany demonstrated that the "Dutch" system, as a system for general use, was at any rate no better than the system over which it had locally asserted its superiority, and the spirit, and not the form, of Maurice's practice achieved the ultimate victory of the Netherlanders. In the Thirty Years' War, the unsuccessful armies of Mansfeld and many others were modelled on the Dutch system,—the forces of Spinola, of Tilly and of Wallenstein, on the Spanish. In other words, these systems as such meant little; the discipline and spirit behind them, everything. Yet the contribution made by the Dutch system to the armies of to-day was not small; to Maurice and his comrades we owe, first the introduction of careful and accurate drill, and secondly the beginnings of an acknowledged science of war, the groundwork of both being the theory and practice of antiquity. The present method of "forming fours" in the British infantry is ultimately derived from Aelian, just as the first beats of the drums in a march represent

the regimental calls of the Landsknechts, and the depots and the drafts for the service battalions date from the Italian wars of Spain.

25. *The Thirty Years' War.*—Hitherto all armies had been raised or reduced according to the military and political situation of the moment. Spain had indeed maintained a relatively high effective in peace, but elsewhere a few personal guards, small garrisons, and sometimes a small regular army to serve as a nucleus, constituted the only permanent forces kept under arms by sovereigns, though, in this era of perpetual wars, armies were almost always on a war footing. The expense of maintenance at that time practically forbade any other system than this, called in German *Werbe-system*, a term for which in English there is no nearer equivalent than "enlistment" or "levy" system. It is worth noticing that this very system is identical in principle with that of the United States at the present day, viz., a small permanent force, inflated to any required size at the moment of need. The exceptional conditions of the Dutch army, indeed, secured for its regiments a long life; yet when danger was finally over, a large portion of the army was at once reduced. The history of the British army from about 1740 to 1820 is a most striking, if belated, example of the *Werbe-system* in practice. But the Thirty Years' War naturally produced an unusual continuity of service in corps raised about 1620-1630, and fifty years later the principle of the standing army was universally accepted. It is thus that the senior regiments of the Prussian and Austrian armies date from about 1630. At this time an event took place which was destined to have a profound influence on the military art. Gustavus Adolphus of Sweden landed in Germany with an army better organized, trained and equipped than any which had preceded it. This army, by its great victory of Breitenfeld (1631), inaugurated the era of "modern" warfare, and it is to the system of Gustavus that the student must turn for the initial point of the progressive development which has produced the armies of to-day. Spanish

and Dutch methods at once became as obsolete as those of the Landsknechts.

26. *The Swedish Army.*—The Swedish army was raised by a carefully regulated system of conscription, which was "preached in every pulpit in Sweden." There were indeed enlisted regiments of the usual type, and it would seem that Gustavus obtained the best even of the soldiers of fortune. But the national regiments were raised on the *Indelta* system. Each officer and man, under this scheme, received a land grant within the territorial district of his corps, and each of these districts supplied recruits in numbers proportionate to its population. This curious mixture of feudal and modern methods produced the best elements of an army, which, aided by the tactical and technical improvements introduced by Gustavus, proved itself incomparably superior to its rivals. Of course the long and bloody campaigns of 1630-34 led to the admission of great numbers of mercenaries even into the Swedish corps; and German, Scottish and other regiments figured largely, not only in the armies of Duke Bernhard and his successors, but in the army of Gustavus' own lifetime. As early as 1632 one brigade of the army was distinguished by the title "Swedish," as alone containing no foreigners. Yet the framework was much the same as it had been in 1630. The battle-organization of two lines and two wings, which was typical of the later "linear" tactics, began to supplant the system of the *tercios*. How cumbrous the latter had become by 1630 may be judged from any battle-plan of the period, and notably from that of Lützen. Gustavus' cavalry fought four or three deep only, and depended as little as possible on the pistol. The work of riding down the pikes was indeed rendered easier by the improved tactical handiness of the musketeers, but it was fiery leading which alone compelled victory, for there were relatively few Swedish horse and many squadrons of Germans and others, who in themselves were far less likely to charge boldly than the "Pappenheimers" and other crack corps of the enemy. The infantry was of the highest class, and only on that

condition could loose and supple lines be trusted to oppose the solid *tercios* of Tilly and Wallenstein. Cumbrous indeed these were, but by long practice they had acquired no small manœuvring power, of which Breitenfeld affords a striking example. The Swedes, however, completely surpassed them. The progress thus made may be gauged from the fact that under Gustavus the largest closed body of infantry was less than 300 strong. Briefly, the genius of a great commander, the ardour of a born cavalry leader, better arms and better organization, carried the Swedes to the end of their career of victory, but how personal was the *vis viva* which inspired the army was quickly noticeable after the death of Gustavus. Even a Bernhard could, in the end, evoke no more heroism from a Swedish army than from any other, and the real Swedish troops fought their last battle at Nördlingen (1634). After this, little distinguished the "Swedish" forces from the general mass of the armies of the time, save their system, to which, and to its influence on the training of such leaders as Banér, Torstensson and Wrangel, all their later victories were due. So much of Gustavus' work survived even the carnage of Nördlingen, and his system always obtained better results, even with the heterogeneous troops of this later period, than any other of the time.

27. *The English Civil War* (see GREAT REBELLION).—The armies on either side which, about the same time, were fighting out the constitutional quarrel in England were essentially different from all those of the continent, though their formal organization was similar to that of the Swedes. The military expression of a national conscience had appeared rarely indeed in the Thirty Years' War, which was a means of livelihood for, rather than an assertion of principle by, those who engaged in it. In England, on the other hand, there were no mercenaries, and the whole character of the operations was settled by the burning desire of a true "nation in arms" to decide at once, by the arbitrament of battle, the vital points at issue. A German critic (Fritz Hoenig) has indicated Worcester as the prototype of Sedan; at any rate,

battles of this kind invariably resulted in failure when entrusted to a "standing" army of the 18th century. But the national armies disappeared at the end of the struggle; after the Restoration, English political aims became, so far as military activity was concerned, similar in scope and execution to those of the continent; and the example of Cromwell and the "New Model," which might have revolutionized military Europe, passed away without having any marked influence on the armies of other nations.

28. *Standing Armies.*—Nine years after Nördlingen, the old Spanish army fought its last and most honourable battle at Rocroi. Its conquerors were the new French troops, whose victory created as great a sensation as Pavia and Creçy had done. Infusing a new military spirit into the formal organization of Gustavus' system, the French army was now to "set the fashion" for a century. France had been the first power to revive regular forces, and the famous "Picardie" regiment disputed for precedence even with the old *tercios*. The country had emerged from the confusion of the past century with the foreign and domestic strength of a practically absolute central power. The Fronde continued the military history of the army from the end of the Thirty Years' War; and when the period of consolidation was finally closed, all was prepared for the introduction of a "standing army," practically always at war strength, and entirely at the disposal of the sovereign. The reorganization of the military establishments by Louvois may be taken as the formal date at which standing armies came into prominence (see historical sketch of the French army below). Other powers rapidly followed the lead of France, for the defects of enlisted troops had become very clear, and the possession of an army always ready for war was an obvious advantage in dynastic politics. The French proprietary system of regiments, and the general scheme of army administration which replaced it, may be taken as typical of the armies of other great powers in the time of Louis XIV.

29. *Character of the Standing Armies.*—A peculiar character was from the first imparted to the new organizations by the results of the Thirty Years' War. A well-founded horror of military barbarity had the effect of separating the soldier from the civilian by an impassable gulf. The drain of thirty years on the population, resources and finances of almost every country in middle Europe, everywhere limited the size of the new armies; and the decision in 1648 of all questions save those of dynastic interest dictated the nature of their employment. The best soldiers of the time pronounced in favour of small field armies, for in the then state of communications and agriculture large forces proved in practice too cumbrous for good work. In every country, therefore, the army took the form of a professional body, nearly though not quite independent of extra recruits for war, set apart entirely from all contact with civil life, rigidly restricted as to conduct in peace and war, and employed mostly in the "maintenance" of their superiors' private quarrels. Iron discipline produced splendid tenacity in action, and wholesale desertion at all times. In the Seven Years' War, for instance, the Austrians stated one-fifth of their total loss as due to desertion, and Thackeray's *Barry Lyndon* gives no untrue picture of the life of a soldier under the old regime. Further, since men were costly, rigid economy of their lives in action, and minute care for their feeding and shelter on the march, occupied a disproportionate amount of the attention of their generals. Armies necessarily moved slowly and remained concentrated to facilitate supply and to check desertion, and thus, when a commander had every unit of his troops within a short ride of his headquarters, there was little need for intermediate general officers, and still less for a highly trained staff.

30. *Organization in the 18th Century.*—All armies were now almost equal in fighting value, and war was consequently reduced to a set of rules (not principles), since superiority was only to be gained by methods, not by men. Soldiers such as Marlborough, who were superior to these jejune

prescriptions, met indeed with uniform success. But the methods of the 18th century failed to receive full illustration, save by the accident of a great captain's direction, even amidst the circumstances for which they were designed. It is hardly to be wondered at, therefore, that they failed, when forced by a new phase of development to cope with events completely beyond their element. The inner organization was not markedly altered. Artillery was still outside the normal organization of the line of battle, though in the period 1660-1740 much was done in all countries to improve the material, and above all to turn the *personnel* into disciplined soldiers. Cavalry was organized in regiments and squadrons, and armed with sabre and pistol. Infantry had by 1703 begun to assume its three-deep line formation and the typical weapons of the arm, musket and bayonet. Regiments and battalions were the units of combat as well as organization. In the fight the company was entirely merged in the higher unit, but as an administrative body it still remained. As for the higher organization, an army consisted simply of a greater or less number of battalions and squadrons, without, as a rule, intermediate commands and groupings. The army was arrayed as a whole in two lines of battle, with the infantry in the centre and the cavalry on the flanks, and an advanced guard; the so-called reserve consisting merely of troops not assigned to the regular commands. It was divided, for command in action, into right and left wings, both of cavalry and infantry, of each line. This was the famous "linear" organization, which in theory produced the maximum effort in the minimum time, but in practice, handled by officers whose chief care was to avoid the expenditure of effort, achieved only negative results. To see its defects one need only suppose a battalion of the first line hard pressed by the enemy. A battalion of the second line was directly behind it, but there was no authority, less than that of the wing commander, which could order it up to support the first. All the conditions of the time were opposed to tactical subdivision, as the term is now understood. That the 18th century

did not revive *schiltrons* was due to the new fire tactics, to which everything but control was sacrificed. This "control," as has been said, implied not so much command as police supervision. But far beyond any faults of organization and recruiting, the inherent vice of these armies was, as Machiavelli had pointed out two centuries previously, and as Prussia was to learn to her cost in 1806, that once they were thoroughly defeated, the only thing left to be done was to make peace at once, since there was no other armed force capable of retrieving a failure.

31. *Frederick the Great.*—The military career of Frederick the Great is very different from those of his predecessors. With an army organized on the customary system, and trained and equipped, better indeed, but still on the same lines as those of his rivals, the king of Prussia achieved results out of all proportion to those imagined by contemporary soldiers. It is to his campaigns, therefore, that the student must refer for the real, if usually latent, possibilities of the army of the 18th century. The prime secret of his success lay in the fact that he was his own master, and responsible to no superior for the uses to which he put his men. This position had never, since the introduction of standing armies, been attained by any one, even Eugene and Leopold of Dessau being subject to the common restriction; and with this extraordinary advantage over his opponents, Frederick had further the firmness and ruthless energy of a great commander. Prussia, moreover, was more strictly organized than other countries, and there was relatively little of that opposition of local authorities to the movement of troops which was conspicuous in Austria. The military successes of Prussia, therefore, up to 1757, were not primarily due to the system and the formal tactics, but were the logical outcome of greater energy in the leading, and less friction in the administration, of her armies. But the conditions were totally different in 1758-1762, when the full force of the alliance against Prussia developed itself in four theatres of war. Frederick was driven back to the old methods of making war, and his men were no longer the soldiers of Leuthen and

Hohenfriedberg. If discipline was severe before, it was merciless then; the king obtained men by force and fraud from every part of Germany, and had both to repress and to train them in the face of the enemy. That under such conditions, and with such men, the weaker party finally emerged triumphant, was indeed a startling phenomenon. Yet its result for soldiers was not the production of the national army, though the dynastic forces had once more shown themselves incapable of compassing decisive victories, nor yet the removal of the barrier between army and people, for the operations of Frederick's recruiting agents made a lasting impression, and, further, large numbers of men who had thought to make a profession of arms were turned adrift at the end of the war. On the contrary, all that the great and prolonged *tour de force* of these years produced was a tendency, quite in the spirit of the age, to make a formal science out of the art of war. Better working and better methods were less sought after than systematization of the special practices of the most successful commanders. Thus Frederick's methods, since 1758 essentially the same as those of others, were taken as the basis of the science now for the first time called "strategy," the fact that his opponents had also practised it without success being strangely ignored. Along with this came a mania for imitation. Prussian drill, uniforms and hair-powder were slavishly copied by every state, and for the next twenty years, and especially when the war-trained officers and men had left active service, the purest pedantry reigned in all the armies of Europe, including that of Prussia. One of the ablest of Frederick's subordinates wrote a book in which he urged that the cadence of the infantry step should be increased by one pace per minute. The only exceptions to the universal prevalence of this spirit were in the Austrian army, which was saved from atrophy by its Turkish wars, and in a few British and French troops who served in the American War of Independence. The British regiments were sent to die of fever in the West

Indies; when the storm of the French Revolution broke over Europe, the Austrian army was the only stable element of resistance.

32. *The French Revolution.*—Very different were the armies of the Revolution. Europe, after being given over to professional soldiers for five hundred years, at last produced the modern system of the "nation in arms." The French volunteers of 1792 were a force by which the routine generals of the enemy, working with instruments and by rules designed for other conditions, were completely puzzled, and France gained a short respite. The year 1793 witnessed the most remarkable event that is recorded in the history of armies. Raw enthusiasm was replaced, after the disasters and defections which marked the beginning of the campaign, by a systematic and unsparing conscription, and the masses of men thus enrolled, inspired by ardent patriotism and directed by the ferocious energy of the Committee of Public Safety, met the disciplined formalists with an opposition before which the attack completely collapsed. It was less marvellous in fact than in appearance that this should be so. Not to mention the influence of pedantry and senility on the course of the operations, it may be admitted that Frederick and his army at their best would have been unable to accomplish the downfall of the now thoroughly roused French. Tactically, the fire of the regulars' line caused the Revolutionary levies to melt away by thousands, but men were ready to fill the gaps. No complicated supply system bound the French to magazines and fortresses, for Europe could once more feed an army without convoys, and roads were now good and numerous. No fear of desertion kept them concentrated under canvas, for each man was personally concerned with the issue. If the allies tried to oppose them on an equal front, they were weak at all points, and the old organization had no provision for the working of a scattered army. While ten victorious campaigns had not carried Marlborough nearer to Paris than some marches beyond the Sambre, two campaigns now carried a French army to within a few miles of Vienna. It was obvious that, before such forces and such

mobility, the old system was doomed, and with each successive failure the old armies became more discouraged. Napoleon's victories finally closed this chapter of military development, and by 1808 the only army left to represent it was the British. Even to this the Peninsular War opened a line of progress, which, if different in many essentials from continental practice, was in any case much more than a copy of an obsolete model.

33. *The Conscription.*—In 1793, at a moment when the danger to France was so great as to produce the rigorous emergency methods of the Reign of Terror, the combined enemies of the Republic had less than 300,000 men in the field between Basel and Dunkirk. On the other hand, the call of the "country in danger" produced more than four times this number of men for the French armies within a few months. Louis XIV., even when all France had been awakened to warlike enthusiasm by a similar threat (1709), had not been able to put in the field more than one-fifth of this force. The methods of the great war minister Carnot were enforced by the ruthless committee, and when men's lives were safer before the bayonets of the allies than before the civil tribunals at home, there was no difficulty in enlisting the whole military spirit of France. There is therefore not much to be said as to the earliest application of the conscription, at least as regards its formal working, since any system possessing elasticity would equally have served the purpose. In the meanwhile, the older plans of organization had proved inadequate for dealing with such imposing masses of men. Even with disciplined soldiers they had long been known as applicable only to small armies, and the deficiencies of the French, with their consequences in tactics and strategy, soon produced the first illustrations of modern methods. Unable to meet the allies in the plain, they fought in broken ground and on the widest possible front. This of course produced decentralization and subdivision; and it became absolutely necessary that each detachment on a front of battle 30 m. long (*e.g.* Stokach) should be properly commanded and self-sufficing. The army was therefore constituted in a number of *divisions*, each of two or more brigades with cavalry and artillery sufficient for its own needs. It was even more important that each divisional general, with his own staff, should be a real commander, and not merely the supervisor of a section of the line of battle, for he was almost in the position that a commander-in-chief had formerly held. The need of generals was easily supplied when there was so wide a field of selection. For the allies the mere adoption of new forms was without result, since it was contrary both to tradition and to existing organization. The attempts which were made in this direction did not tend to mitigate the evils of inferior numbers and *moral*. The French soon followed up the divisional system with the further organization of groups of divisions under specially selected general officers; this again quickly developed into the modern army corps.

34. *Napoleon.*—Revolutionary government, however, gave way in a few years to more ordinary institutions, and the spirit of French politics had become that of aggrandizement in the name of liberty. The ruthless application of the new principle of masses had been terribly costly, and the disasters of 1799 reawakened in the mass of the people the old dislike of war and service. Even before this it had been found necessary to frame a new act, the famous law proposed by General Jourdan (1798). With this the conscription for general service began. The legal term of five years was so far exceeded that the service came to be looked upon as a career, or servitude, for life; it was therefore both unavoidable and profitable to admit substitutes. Even in 1806 one quarter of Napoleon's conscripts failed to come up for duty. The *Grande Armée* thus from its inception contained elements of doubtful value, and only the tradition of victory and the 50% of veterans still serving aided the genius of Napoleon to win the brilliant victories of 1805 and 1806. But these veterans were gradually eliminated by bloodshed and service exposure, and when, after the peace of Tilsit, "French" armies began to be recruited from all sorts of nations, decay had set in. As early as 1806 the emperor had had to "anticipate" the conscription, that is, call up the conscripts before their time, and by 1810 the percentage of absentees in France had grown to about 80, the remainder being largely those who lacked courage to oppose the authorities. Finally, the armies of Napoleon became masses of men of all nations fighting even more unwillingly than the armies of the old régime. Little success attended the emperor's attempt to convert a "nation in arms" into a great dynastic army. Considered as such, it had even fewer elements of solidity than the standing armies of the 18th century, for it lacked the discipline which had made the regiments of Frederick invincible. After 1812 it was attacked by huge armies of patriots which possessed advantages of organization and skilful direction that the *levée en masse* of 1793 had lacked. Only the now fully developed genius and magnificent tenacity of Napoleon staved off for a time the *débâcle* which was as inevitable as had been that of the old régime.

35. *The Grande Armée.*—In 1805-1806, when the older spirit of the Revolution was already represented by one-half only of French soldiers, the actual steadiness and manœuvring power of the *Grande Armée* had attained its highest level. The army at this time was organized into brigades, divisions and corps, the last-named unit being as a rule a marshal's command, and always completed as a small army with all the necessary arms and services. Several such corps (usually of unequal strength) formed the army. The greatest weakness of the organization, which was in other respects most pliant and adaptable, was the want of good staff-officers. The emperor had so far cowed his marshals that few of them could take the slightest individual responsibility, and the combatant staff-officers remained, as they had been in the 18th century, either confidential clerks or merely gallopers. No one but a Napoleon could have managed huge armies upon these terms; in fact the marshals, from Berthier downwards, generally failed when in independent commands. Of the three arms, infantry and cavalry regiments were organized in much the same way as in Frederick's day, though tactical methods were very different, and discipline far inferior. The greatest advance had taken place in the artillery service. Field and horse batteries, as organized and disciplined units, had come into general use during the Revolutionary wars, and the division, corps and army commanders had always batteries assigned to their several commands as a permanent and integral part of the fighting troops. Napoleon himself, and his brilliant artillery officers Sénarmont and Drouot, brought the arm to such a pitch of efficiency that it enabled him to win splendid victories almost by its own action. As a typical organization we may take the III. corps of Marshal Davout in 1806. This was formed of the following troops:—

Cavalry brigade—General Vialannes—three regiments, 1538 men. Corps artillery, 12 guns.

1st Division—General Morand—five infantry regiments in three brigades, 12 guns, 10,820 men.

2nd Division—General Friant—five regiments in three brigades, 8 guns, 8758 men.

3rd Division—General Gudin—four regiments in three brigades, 12 guns, 9077 men.

A comparison of this *ordre de bataille* with that of a modern army corps will show that the general idea of corps organization has undergone but slight modification since the days of Napoleon. More troops allotted to departmental duties, and additional engineers for the working of modern scientific aids, are the only new features in the formal organization of a corps in the 20th century. Yet the spirit of 1806 and that of 1906 were essentially different, and the story of the development of this difference through the 19th century closes for the present the history of progress in tactical organization.

36. *The Wars of Liberation.*—The Prussian defeat at Jena was followed by a national surrender so abject as to prove conclusively the eternal truth, that a divorce of armies from national interests is completely fatal to national well-being. But the oppression of the victors soon began to produce a spirit of ardent patriotism which, carefully directed by a small band of able soldiers, led in the end to a national uprising of a steadier and more lasting kind than that of the French Revolution. Prussia was compelled, by the rigorous treaty of peace, to keep a small force only under arms, and circumstances thus drove her into the path of military development which she subsequently followed. The stipulation of the treaty was evaded by the *Krümper* system, by which men were passed through the ranks as hastily as possible and dismissed to the reserve, their places being taken by recruits. The regimental establishments were therefore mere *cadres*, and the *personnel*, recruited by universal service with few exemptions, ever-changing. This system depended on the willingness of the reserves to come up when called upon, and the arrogance of the French was quite sufficient to ensure this. The *dénouement* of the Napoleonic wars came too swiftly for the full development of the armed strength of Prussia on these lines; and at the outbreak of the Wars of Liberation a newly formed *Landwehr* and numerous volunteer corps took the field with no more training than the French had had in 1793. Still, the principles of universal service (*allgemeine Wehrpflicht*) and of the army reserve were, for the first time in modern history, systematically put into action, and modern military development has concerned itself more with the consolidation of the *Krümper* system than with the creation of another. The début of

the new Prussian army was most unsuccessful, for Napoleon had now attained the highest point of soldierly skill, and managed to inflict heavy defeats on the allies. But the Prussians were not discouraged; like the French in 1793 they took to broken ground, and managed to win combats against all leaders opposed to them except Napoleon himself. The Russian army formed a solid background for the Prussians, and in the end Austria joined the coalition. Reconstituted on modern lines, the Austrian army in 1813, except in the higher leading, was probably the best-organized on the continent. After three desperate campaigns the Napoleonic régime came to an end, and men felt that there would be no such struggle again in their lifetime. Military Europe settled down into grooves along which it ran until 1866. France, exhausted of its manhood, sought a field for military activities in colonial wars waged by long-service troops. The conscription was still in force, but the citizens served most unwillingly, and substitution produced a professional army, which as usual became a dynastic tool. Austria, always menaced with foreign war and internal disorder, maintained the best army in Europe. The British army, though employed far differently, retained substantially the Peninsular system.

37. *European Armies 1815-1870.*—The events of the period 1815-1859 showed afresh that such long-service armies were incomparably the best form of military machine for the purpose of giving expression to a hostile "view" (not "feeling"). Austrian armies triumphed in Italy, French armies in Spain, Belgium, Algeria, Italy and Russia, British in innumerable and exacting colonial wars. Only the Prussian forces retained the characteristics of the levies of 1813, and the enthusiasm which had carried these through Leipzig and the other great battles was hardly to be expected of their sons, ranged on the side of despotism in the troubled times of 1848-1850. But the principle was not permitted to die out. The Bronnzell-Olmütz incident of 1850 (see SEVEN WEEKS' WAR) showed that the organization of 1813 was defective, and this was altered in spite of the fiercest opposition of all classes. Soon afterwards, and before the new Prussian army proved itself on a great battlefield, the American Civil War, a fiercer struggle than any of those which followed it in Europe, illustrated the capabilities and the weaknesses of voluntary-service troops. Here the hostile "view" was replaced by a hostile "feeling," and the battles of the disciplined enthusiasts on either side were of a very different kind from those of contemporary Europe. But, if the experiences of 1861-1865 proved that armies voluntarily enlisted "for the war" were capable of unexcelled feats of endurance, they proved further that such armies, whose discipline and training in peace were relatively little, or indeed wholly absent, were incapable of forcing a swift decision. The European "nation in arms," whatever its other failings, certainly achieved its task, or failed decisively to do so, in the shortest possible time. Only the special characteristics of the American theatre of war gave the Union and Confederate volunteers the space and time necessary for the creation of armies, and so the great struggle in North America passed without affecting seriously the war ideas and preparations of Europe. The weakness of the staff work with which both sides were credited helped further to confirm the belief of the Prussians in their system, and in this instance they were justified by the immense superiority of their own general staff to that of any army in existence. It was in this particular that a corps of 1870 differed so essentially from a corps of Napoleon's time. The formal organization had not been altered save as the varying relative importance of the separate arms had dictated. The almost intangible spirit which animates the members of a general staff, causes them not merely to "think"—that was always in the quartermaster-general's department—but to "think alike," so that a few simple orders called "directives" sufficed to set armies in motion with a definite purpose before them, whereas formerly elaborate and detailed plans of battle had to be devised and distributed in order to achieve the object in view. A comparison of the number of orders and letters written by a marshal and by his chief of staff in Napoleon's time with similar documents in 1870 indicates clearly the changed position of the staff. In the *Grande Armée* and in the French army of 1870 the officers of the general staff were often absent entirely from the scene of action. In Prussia the new staff system produced a far different result—indeed, the staff, rather than the Prussian military system, was the actual victor of 1870. Still, the system would probably have conquered in the end in any case, and other nations, convinced by events that their

departure from the ideal of 1813, however convenient formerly, was no longer justified, promptly copied Prussia as exactly, and, as a matter of fact, as slavishly, as they had done after the Seven Years' War.

38. *Modern Developments.*—Since 1870, then, with the single exception of Great Britain, all the major European powers have adopted the principle of compulsory short service with reserves. Along with this has come the fullest development of the territorial system (see below). The natural consequence therefore of the heavy work falling upon the shoulders of the Prussian officer, who had to instruct his men, was, in the first place, a general staff of the highest class, and in the second, a system of distributing the troops over the whole country in such a way that the regiments were permanently stationed in the district in which they recruited and from which they drew their reserves. Prussia realized that if the reservists were to be obtained when required the unit must be strictly localized; France, on the contrary, lost much time and spent much trouble, in the mobilization of 1870, in forwarding the reservists to a regiment distant, perhaps, 300 m. The Prussian system did not work satisfactorily at first, for until all the district staff-officers were trained in the same way there was great inequality in the efficiency of the various army corps, and central control, before the modern development of railways, was relatively slight. Further, the mobilization must be completed, or nearly so, before concentration begins, and thus an active professional army, always at war strength, might annihilate the frontier corps before those in the interior were ready to move. But the advantages far outweighed the defects of the system, and, such professional armies having after 1870 disappeared, there was little to fear. Everywhere, therefore, save in Great Britain (for at that time the United States was hardly counted as a great military power, in spite of its two million war-trained veterans in civil life), the German model was followed, and is now followed, with but slight divergence. The period of reforms after the Prussian model (about 1873-1890) practically established the military systems which are treated below as those of the present day. The last quarter of the century witnessed a very great development of military forces, without important organic changes. The chief interest to the student of this period lies in the severe competition between the great military powers for predominance in numbers, expressed usually in the reduction of the period of service with the colours to a minimum. The final results of this cannot well be predicted: it is enough to say that it is the *Leitmotiv* in the present stage in the development of armies. Below will be found short historical sketches of various armies of the present day which are of interest in respect of their historical development. Details of existing forces are given in articles dealing with the several states to which they belong. Historical accounts of the armies of Japan and of Egypt will be found in the articles on those states. The Japanese wars of 1894-95 and 1904-5 contributed little to the history of military organization as a pure science. The true lessons of this war were the demonstration of the wide applicability of the German methods, upon which exclusively the Japanese army had formed itself, and still more the first illustration of the new moral force of nationalities as the decisive factor. The form of armies remained unaltered. Neither the events of the Boer War of 1899-1902 nor the Manchurian operations were held by European soldiers to warrant any serious modifications in organization. It is to the moral force alluded to above, rather than to mere technical improvements, that the best soldiers of Europe, and notably those of the French general staff (see the works of General H. Bonnal), have of late years devoted their most earnest attention.

Present-Day Armies

39. The main principles of all military organization as developed in history would seem to be national recruiting and allegiance, distinctive methods of training and administration, continuity of service and general homogeneity of form. The method of raising men is of course different in different states. In this regard armies may conveniently be classed as voluntarily enlisted, levied or conscript, and militia, represented respectively by the forces of Great Britain, Germany and Switzerland. It must not be forgotten, however, that voluntary troops may be

and are maintained even in states in which the bulk of the army is levied by compulsion, and the simple militia obligation of defending the country is universally recognized.

40. *Compulsory Service.*—Universal liability to service (*allgemeine Wehrpflicht*) draws into the active army all, or nearly all, the men of military age for a continuous period of short service, after which they pass successively to the reserve, the second and the third line troops (*Landwehr, Landsturm*, &c.). In this way the greatest number of soldiers is obtained at the cheapest rate and the number of trained men in reserve available to keep the army up to strength is in theory that of the able-bodied manhood of the country. In practice the annual levy is, however, not exhaustive, and increased numerical strength is obtained by reducing the term of colour-service to a minimum. This may be less in a hard-worked conscript army than in one which depends upon the attractions of the service to induce recruits to join. In conscript armies, training for war is carried out with undeviating rigour. In these circumstances the recruits are too numerous and the time available is too limited for the work of training to be committed to a few selected instructors, and every officer has therefore to instruct his own men. The result is usually a corps of officers whose capacity is beyond question, while the general staff is composed of men whose ability is above a high general average. As to the rank and file, the men taken for service are in many respects the best of the nation, and this superiority is progressively enhanced, since increase of population is not often accompanied by a corresponding increase in the military establishments. In Germany in 1905, it is stated, nearly half the contingent was excused from serving in peace time, over and above the usual numbers exempted or medically rejected. The financial aspect of compulsory service may be summed up in a few words. The state does not offer a wage, the pay of the soldier is a mere trifle, and, for a given expenditure, at least three times as many men may be kept under arms as under any known "voluntary" system. Above all, the state has at its disposal for war an almost inexhaustible supply of trained soldiers. This aspect of compulsory service has indeed led its admirers sometimes to sacrifice quality to quantity; but, provided always that the regular training is adequate, it may be admitted that there is no limit to the numbers which are susceptible of useful employment. There are, however, many grave defects inherent in all armies raised by compulsory levy (see CONSCRIPTION, for a discussion of the chief economical and social questions involved). Most of the advantages of universal service result, not from the compulsory enlistment, but from the principle of short service and reserves. But the cost of maintaining huge armies of the modern European type on the voluntary system would be entirely prohibitive, and those nations which have adopted the *allgemeine Wehrpflicht* have done so with full cognizance of the evil as well as of the good points of the system.

The chief of these evils is the doubtful element which exists in all such armies. Under the merciless discipline of the old régime the most unwilling men feared their officers more than the enemy. Modern short service, however, demands the good-will of all ranks and may fail altogether to make recalcitrants into good soldiers, and it may be taken for granted that every conscript army contains many men who cannot be induced to fight. Herein lies the justification of the principle of "masses," and of reduced colour-service; by drawing into the ranks the maximum number of men, the government has an eventual residuum of the bravest men in the nation left in the ranks. What has been said of the officers of these armies cannot be applied to the non-commissioned officers. Their promotion is necessarily rapid, and the field of selection is restricted to those men who are willing to re-engage, *i.e.* to serve beyond their compulsory term of two or three years. Many men do so to avoid the struggles of civil life, and such "fugitive and cloistered virtue" scarcely fosters the moral strength required for command. As the best men return to civil life, there is no choice but to promote inferior men, and the latter, when invested with authority, not infrequently abuse it. Indeed in some armies the soldier regards his officer chiefly as his protector from the rapacity or cruelty of his sergeant or corporal. A true short-service army is almost incapable of being employed on peace service abroad; quite apart from other considerations, the cost of conveying to and from home annually one-third or one-half of the troops would be prohibitive. If, as must be the case, a professional force is maintained for oversea service many men would join it who would otherwise be serving as non-commissioned officers at home

and the prevailing difficulty would thus be enhanced. When colonial defence calls for relatively large numbers of men, *i.e.* an army, home resources are severely strained.

41. *Conscription* in the proper sense, *i.e.* selection by lot of a proportion of the able-bodied manhood of a country, is now rarely practised. The obvious unfairness of selection by lot has always had the result of admitting substitutes procured by those on whom the lot has fallen; hence the poorer classes are unduly burdened with the defence of the country, while the rich escape with a money payment. In practice, conscription invariably produces a professional long-service army in which each soldier is paid to discharge the obligations of several successive conscripts. Such an army is therefore a voluntary long-service army in the main, *plus* a proportion of the unwilling men found in every forced levy. The gravest disadvantage is, however, the fact that the bulk of the nation has not been through the regular army at all; it is almost impossible to maintain a large and costly standing army and at the same time to give a full training to auxiliary forces. The difference between a "national guard" such as that of the siege of Paris in 1870-71 and a *Landwehr* produced under the German system, was very wide. Regarded as a compromise between universal and voluntary service, conscription still maintains a precarious existence in Europe. As the cardinal principle of recruiting armies, it is completely obsolete.

42. *Voluntary Service.*—Existing voluntary armies have usually developed from armies of the old régime, and seem to owe their continued existence either to the fact that only comparatively small armaments are maintained in peace, other and larger armies being specially recruited during a war (a modification of the "enlistment system"), or to the necessities of garrisoning colonial empires. The military advantages and disadvantages of voluntary service are naturally the faults and merits of the opposite system. The voluntary army is available for general service. It includes few unwilling soldiers, and its resultant advantage over an army of the ordinary type has been stated to be as high as 30%. At all events, we need only examine military history to find that with conscript armies wholesale shirking is far from unknown. That loss from this cause does not paralyse operations as it paralysed those of the 18th century, is due to the fact that such fugitives do not desert to the enemy, but reappear in the ranks of their own side; it must not therefore be assumed that men have become braver because the "missing" are not so numerous. In colonial and savage warfare the superior personal qualities of the voluntary soldier often count for more than skill on the part of the officers. These would be diminished by shortening the time of service, and this fact, with the expense of transport, entails that a reasonably long period must be spent with the colours. On the other hand, the provision of the large armies of modern warfare requires the maintenance of a reserve, and no reserve is possible if the whole period for which men will enlist is spent with the colours. The demand for long service in the individual, and for trained men in the aggregate, thus produces a compromise. The principle of long service, *i.e.* ten years or more with the colours, is not applicable to the needs of the modern *grande guerre*; it gives neither great initial strength nor great reserves. The force thus produced is costly and not lightly to be risked; it affords relatively little opportunity for the training of officers, and tends to become a class apart from the rest of the population. On the other hand, such a force is the best possible army for foreign and colonial service. A state therefore which relies on voluntary enlistment for its forces at home and abroad, must either keep an army which is adaptable to both functions or maintain a separate service for each.

In a state where relatively small armaments are maintained in peace, voluntary armies are infinitely superior to any that could be obtained under any system of compulsion. The state can afford to give a good wage, and can therefore choose its recruits carefully. It can thus have either a few incomparable veteran soldiers (long-service), or a fairly large number of men of superior physique and intelligence, who have received an adequate short-service training. Even the youngest of such men are capable of good service, while the veterans are probably better soldiers than any to be found in conscript armies. This is, however, a special case. The raw material of any but a small voluntary army usually tends to be drawn from inferior sources; the cost of a larger force, paid the full wages of skilled labourers, would be very great, and numbers commensurate with those of an army of the other model

could only be obtained at an exorbitant price. The short-service principle is therefore accepted. Here, however, as recruiting depends upon the good-will of the people, it is impossible to work the soldiers with any degree of rigour. Hence the voluntary soldier must serve longer than a conscript in order to attain the same proficiency. The reserve is thus weakened, and the total trained regular force diminished. Moreover, as fewer recruits are required annually, there is less work for the officers to do. In the particular case of Great Britain it is practically certain that in future, reliance will be placed upon the auxiliary forces and the civil population for the provision of the enormous reserves required in a great war; this course is, however, only feasible in the case of an insular nation which has time to collect its strength for the final and decisive blow overseas. The application of the same principle to a continental military power depends on the capacity for stern and unflagging resistance displayed by the *corps de couverture* charged with the duty of gaining the time necessary for the development and concentration of the national masses. In Great Britain (except in the case of a surprise invasion) the place of this corps would be taken by "command of the sea." Abroad, the spirit of the exposed regiments themselves furnishes the only guarantee, and this can hardly be calculated with sufficient certainty, under modern conditions, to justify the adoption of this new "enlistment system." Voluntary service, therefore, with all its intrinsic merits, is only applicable to the conditions of a great war when the war reserve can be trained *ad hoc*.

43. The militia idea (see MILITIA) has been applied most completely in Switzerland, which has no regular army, but trains almost the whole nation as a militia. The system, with many serious disadvantages, has the great merit that the maximum number of men receives a certain amount of training at a minimum cost both to the state and to the individual. Mention should also be made of the system of augmenting the national forces by recruiting "foreign legions." This is, of course, a relic of the *Werbe-system*; it was practised habitually by the British governments of the 18th and early 19th centuries. "Hessians" figured conspicuously in the British armies in the American War of Independence, and the "King's German Legion" was only the best and most famous of many foreign corps in the service of George III. during the Revolutionary and Napoleonic wars. A new German Legion was raised during the Crimean War, but the almost universal adoption of the *Krümper* system has naturally put an end to the old method, for all the best recruits are now accounted for in the service of their own countries.

ARMY ORGANIZATION

44. *Arms of the Service.*—Organization into "arms" is produced by the multiplicity of the weapons used, their functions and their limitations. The "three arms"—a term universally applied to infantry (*q.v.*), cavalry (*q.v.*) and artillery (*q.v.*)—coexist owing to the fact that each can undertake functions which the others cannot properly fulfil. Thus cavalry can close with an enemy at the quickest pace, infantry can work in difficult ground, and artillery is effective at great ranges. Infantry indeed, having the power of engaging both at close quarters and at a distance, constitutes the chief part of a fighting force. Other "arms," such as mounted infantry, cyclists, engineers, &c., are again differentiated from the three chief arms by their proper functions. In deciding upon the establishment in peace, or the composition of a force for war, it is therefore necessary to settle beforehand the relative importance of these functions in carrying out the work in hand. Thus an army operating in Essex would be unusually strong in infantry, one on Salisbury Plain would possess a great number of guns, and an army operating on the South African veldt would consist very largely of mounted men. The normal European war has, however, naturally been taken as the basis upon which the relative proportions of the three arms are calculated. At the battle of Kolin (1757) the cavalry was more than half as strong as the infantry engaged. At Borodino (1812) there were 39 cavalry to 100 of other arms, and 5 guns per 1000 men. In 1870 the Germans had at the outset 7 cavalrymen to every 100 men of other arms, the French 10. As for guns, the German artillery had 3, the French 3½ per 1000 men. In more modern times the proportions have undergone some alteration, the artillery having been increased, and the cavalry brought nearer to the Napoleonic standard. Thus the relative proportions, in peace time, now stand at 5 or 6 guns per 1000

men, and 16 cavalry soldiers to 100 men of other arms. It must be borne in mind that cavalry and artillery are maintained in peace at a higher effective than infantry, the strength of the latter being much inflated in war, while cavalry and artillery are not easily extemporized. Thus in the Manchurian campaign these proportions were very different. The Russian army on the eve of the battle of Mukden (20th of February 1905) consisted of 370 battalions, 142 squadrons and 153 field batteries (1200 guns), with, in addition, over 200 heavy guns. The strength of this force, which was organized in three armies, was about 300,000 infantry and 18,000 cavalry and Cossacks, with 3½ guns per 1000 men of other arms. The Japanese armies consisted of 300,000 infantry, 11,000 cavalry, 900 field and 170 heavy guns, the proportion of field artillery being 2½ guns per 1000 men.

It is perhaps not superfluous to mention that all the smaller units in a modern army consist of one arm only. Formerly several dissimilar weapons were combined in the same unit. The knight with his four or five variously armed retainers constituted an example of this method of organization, which slowly died out as weapons became more uniform and their functions better defined.

45. *Command.*—The first essential of a good organization is to ensure that each member of the organized body, in his own sphere of action, should contribute his share to the achievement of the common object. Further, it is entirely beyond the power of one man, or of a few, to control every action and provide for every want of a great number of individuals. The modern system of command, therefore, provides for a system of grades, in which, theoretically, officers of each grade control a group of the next lower units. A lieutenant-colonel, for instance, may be in charge of a group of eight companies, each of which is under a captain. In practice, all armies are permanently organized on these lines, up to the colonel's or lieutenant-colonel's command, and most of them are permanently divided into various higher units under general officers, the brigade, division and army corps. The almost invariable practice is to organize *infantry* into companies, battalions and regiments. *Cavalry* is divided into troops, squadrons and regiments. *Artillery* is organized in batteries, these being usually grouped in various ways. The other arms and departments are subdivided in the same general way. The commands of general officers are the *brigade* of infantry, cavalry, and in some cases artillery, the *division* of two or more infantry brigades and a force of artillery and mounted troops, or of cavalry and horse artillery, and the *army corps* of two or more divisions and "corps troops." *Armies* of several corps, and *groups of armies* are also formed.

46. A *brigade* is the command of a brigadier or major-general, or of a colonel. It consists almost invariably of one arm only. In armies of the old régime it was not usual to assign troops of all arms to the subordinate generals. Hence the brigade is a much older form of organization than the division of all arms, and in fact dates from the 16th century. The infantry brigade consists, in the British service, of the brigadier and his staff, four battalions of infantry, and administrative and medical units, the combatant strength being about 4000 men. In Germany and France the brigade is composed of the staff, and two regiments (6 battalions) with a total of over 6000 combatants at war strength. The cavalry brigade is sometimes formed of three, sometimes of two regiments; the number of squadrons to a regiment on service is usually four, exceptionally three, and rarely five and six. The "brigade" of artillery in Great Britain is a lieutenant-colonel's command, and the term here corresponds to the *Abtheilung* of the German, and the *groupe* of the French armies (see ARTILLERY). In Germany and France, however, an artillery brigade consists of two or more regiments, or twelve batteries at least, under the command of an artillery general officer.

47. A *division* is an organization containing troops of all arms. Since the virtual abolition of the "corps artillery" (see ARTILLERY), the force of field artillery forming part of an infantry division is sometimes as high as 72 guns (Germany); in Great Britain the augmented division of 1906 has 54 field guns, 12 field howitzers, and 4 heavy guns, a total of 70. The term "infantry" division is, in strictness, no longer applicable, since such a unit is a miniature army corps of infantry, artillery and cavalry, with the necessary services for the supply of ammunition, food and forage, and for the care of the sick and wounded. A more exact title would be "army" division. In general

it is composed, so far as combatants are concerned, of the divisional commander and his staff, two or more infantry brigades, a number of batteries of field artillery forming a regiment, brigade or group, a small force, varying from a squadron to a regiment, of cavalry (divisional cavalry), with some engineers. The force of the old British division (1905) may be taken, on an average, as 10,000 men, increased in the 1906 reorganization to about 15,000 combatants. In other armies the fighting force of the division amounts to rather more than 14,000. The *cavalry division* (see CAVALRY) is composed of the staff, two or three cavalry brigades, horse artillery, with perhaps mounted infantry, cyclists, or even light infantry in addition. In many, if not most, armies cavalry divisions are formed only in war. In the field the cavalry division is usually an independent unit with its own commander and staff. "Cavalry corps" of several divisions have very rarely been formed in the past, a division having been regarded as the largest unit capable of being led by one man. There is, however, a growing tendency in favour of the corps organization, at any rate in war.

48. *Army Corps.*—The "corps" of the 18th century was simply a large detachment, more or less complete in itself, organized for some particular purpose (*e.g.* to cover a siege), and placed for the time being under some general officer other than the chief commander. The modern army corps is a development from the division of all arms, which originated in the French Revolutionary wars. It is a unit of considerable strength, furnished with the due proportion of troops of all arms and of the auxiliary and medical services, and permanently placed under the command of one general. The corps organization (though a *corps d'armée* was often spoken of as an *armée*) was used in Napoleon's army in all the campaigns of the Empire. It may be mentioned, as a curious feature of Napoleon's methods, that he invariably constituted each *corps d'armée* of a different strength, so that the enemy would not be able to estimate his force by the simple process of counting the corps flags which marked the marshals' headquarters. Thus in 1812 he constituted one corps of 72,000 men, while another had but 18,000. After the fall of Napoleon a further advance was made. The adoption of universal service amongst the great military nations brought in its train the territorial organization, and the corps, representing a large district, soon became a unit of peace formation. For the smooth working of the new military system it was essential that the framework of the war army should exist in peace. The Prussians were the first to bring the system to perfection; long before 1866 Prussia was permanently divided into army corps districts, all the troops of the III. army corps being Brandenburgers, all those of the VI. Silesians, and so on, though political reasons required, and to some extent still require, modifications of this principle in dealing with annexed territory (*e.g.* Hanover and Alsace-Lorraine). The events of 1866 and of 1870-71 caused the almost universal adoption of the army corps regional system. In the case of the British army, operating as it usually did in minor wars, and rarely having more than sixty or seventy thousand men on one theatre even in continental wars, there was less need of so large a unit as the corps. Not only was a British army small in numbers, but it preserved high traditions of discipline, and was sufficiently well trained to be susceptible as a unit to the impulse given by one man. Even where the term "corps" does appear in Peninsular annals, the implication is of a corps in the old sense of a grand detachment. Neither cavalry nor artillery was assigned to any of the British "corps" at Waterloo.

49. *Constitution of the Army Corps.*—In 1870-71 the III. German army corps (with which compare Marshal Davout's *ordre de bataille* above) consisted of the following combatant units: (*a*) staff; (*b*) two infantry divisions (4 brigades. 8 regiments or 24 battalions), with, in each division, a cavalry regiment, 4 batteries of artillery or 24 guns, and engineers; (*c*) corps troops, artillery (6 field batteries), pioneer battalion (engineers), train battalion (supply and transport). A rifle battalion was attached to one of the divisions.

This *ordre de bataille* was followed more or less generally by all countries up to the most modern times, but between 1890 and 1902 came a very considerable change in the point of view from which the corps was regarded as a fighting unit. This change was expressed in the abolition of the corps artillery. Formerly the corps commander controlled the greater part of the field artillery, as well as troops of other arms; at the present time he has a mere

handful of troops. Unless battalions are taken from the divisions to form a corps reserve, the direct influence of the corps organization on the battle is due almost solely to the fact that the commander has at his disposal the special natures of artillery and also some horse artillery. Thus the (augmented) division is regarded by many as the fighting unit of the 20th, as the corps was that of the 19th century. In Europe there is even a tendency to substitute the ancient phrase "reserve artillery" for "corps artillery," showing that the role to be played by the corps batteries is subordinated to the operations of the masses of divisional artillery, the whole being subject, of course, to the technical supervision of the artillery general officer who accompanies the corps headquarters. Thus limited, the army corps has now come to consist of the staff, two or more divisions, the corps or reserve artillery (of special batteries), a small force of "corps" cavalry, and various technical and departmental troops. The cavalry is never very numerous, owing to the demands of the independent cavalry divisions on the one hand and those of the divisional cavalry on the other. The engineers of an army corps include telegraph, balloon and pontoon units. Attached to the corps are reserves of munitions and supplies in ammunition columns, field parks, supply parks, &c. The term and the organization were discontinued in England in 1906, on the augmentation of the divisions and the assignment of certain former "corps troops" to the direct control of the army commanders. It should be noticed that the Japanese, who had no corps organization during the war of 1904-5, afterwards increased the strength of their divisions from 15,000 to 20,000; the augmented "division," with the above *peace* strength, becomes to all intents and purposes a corps, and the generals commanding divisions were in 1906 given the title of generals-in-chief.

50. *Army.*—The term "army" is applied, in war time, to any command of several army corps, or even of several divisions, operating under the orders of one commander-in-chief. The army in this sense (distinguished by a number or by a special title) varies, therefore, with circumstances. In the American Civil War, the Army of the Ohio consisted in 1864 only of the army staff and the XXIII. corps. At the other extreme we find that the German II. Army in 1870 consisted of seven army corps and two cavalry divisions, and the III. Army of six army corps and two cavalry divisions. The term "army" in this sense is therefore very elastic in its application, but it is generally held that large groups of corps operating in one theatre of war should be subdivided into armies, and that the strength of an army should not exceed about 150,000 men, if indeed this figure is reached at all. This again depends upon circumstances. It might be advisable to divide a force of five corps into two armies, or on the other hand it might be impossible to find suitable leaders for more than two armies when half a million men were present for duty. In France, organization has been carried a step further. The bulk of the national forces is, in case of war, organized into a "group of armies" under a commander, usually, though incorrectly, called the *generalissimo*. This office, of course, does not exist in peace, but the insignia, the distinctive marks of the headquarters flag, &c., are stated in official publications, and the names of the generalissimo and of his chief of staff are known. Under the generalissimo would be four or five army commanders, each with three or four army corps under him. Independent of this "group of armies" there would be other and minor "armies" where required.

51. *Chief Command.*—The leading of the "group of armies" referred to above does not, in France, imply the supreme command, which would be exercised by the minister of war in Paris. The German system, on the other hand, is based upon the leadership of the national forces by the sovereign in person, and even though the headquarters of the "supreme war lord" (*Oberste Kriegsherr*) are actually in the field in one theatre of operations, he directs the movements of the German armies in all quarters. Similarly, in 1864, General Grant accompanied and controlled as a "group" the Armies of the Potomac and the James, supervising at the same time the operations of other groups and armies. In the same campaign a subordinate general, Sherman, commanded a "group" consisting of the Armies of the Tennessee, the Cumberland and the Ohio. The question as to whether the supreme command and the command of the principal group of armies should be in the same hands is very difficult of solution. In practice, the method adopted in each case usually grows out of the military and political conditions. The advantage of the German method is that the supreme commander is in actual contact with the troops, and can therefore form an accurate judgment of their powers. Under these conditions the risk of having cabinet strategy forced upon the

generals is at its minimum, and more especially so if the supreme commander is the head of the state. On the other hand, his judgment is very liable to be influenced unduly by facts, coming under his own notice, which may in reality have no more than a local significance. Further, the supreme commander is at the mercy of distant subordinates to a far greater degree than he would be if free to go from one army to another. Thus, in 1870 the king of Prussia's headquarters before Paris were subjected to such pressure from subordinate army commanders that on several occasions selected staff-officers had to be sent to examine, for the king's private information, the real state of things at the front. The conduct of operations by one group commander in the campaign of 1864 seemed, at a distance, so eccentric and dangerous that General Grant actually left his own group of armies and went in person to take over command at the threatened point. Balanced judgment is thus often impossible unless the supreme command is independent of, and in a position to exercise general supervision over, each and every group or army. At the other end of the scale is the system of command employed by the Turks in 1877, in which four armies, three of them being actually on the same theatre of war, were directed from Constantinople. This system may be condemned unreservedly. It is recognized that, once the armies on either side have become seriously engaged, a commander-in-chief on the spot must direct them. Thus in 1904, while the Japanese and Russian armies were under the supreme command of their respective sovereigns, General Kuropatkin and Marshal Oyama personally commanded the chief groups of armies in the field. This is substantially the same as the system of the French army. It is therefore permissible to regard the system pursued by the Germans in 1870, and by the Union government in 1864, more as suited to special circumstances than as a general rule. As has been said above, the special feature of the German system of command is the personal leadership of the German emperor, and this brings the student at once to the consideration of another important part of the "superior leading."

52. The *Chief of the General Staff* is, as his title implies, the chief staff officer of the service, and as such, he has duties of the highest possible importance, both in peace and war. For the general subject of staff duties see STAFF. Here we are concerned only with the peculiar position of the chief of staff under a system in which the sovereign is the actual commander-in-chief. It is obvious in the first place that the sovereign may not be a great soldier, fitted by mental gifts, training and character to be placed at the head of an army of, perhaps, a million men. Allowing that it is imperative that, whatever he may be in himself, the sovereign should *ex officio* command the armies, it is easy to see that the ablest general in these armies must be selected to act as his adviser, irrespective of rank and seniority. This officer must therefore be assigned to a station beyond that of his army rank, and his orders are in fact those of the sovereign himself. Nor is it sufficient that he should occupy an unofficial position as adviser, or *ad latus*. If he were no more than this, the sovereign could act without his adviser being even aware of the action taken. As the staff is the machinery for the transmission of orders and despatches, all orders of the commander-in-chief are signed by the chief of staff as a matter of course, and this position is therefore that in which the adviser has the necessary influence. The relations between the sovereign and his chief military adviser are thus of the first importance to the smooth working of the great military machine, and never have the possibilities of this apparently strange system been more fully exploited than by King William and his chief of staff von Moltke in 1866 and in 1870-71. It is not true to say that the king was the mere figurehead of the German armies, or that Moltke was the real commander-in-chief. Those who have said this forget that the sole responsibility for the consequences of every order lay with the king, and that it is precisely the fear of this responsibilty that has made so many brilliant subordinates fail when in chief command. The characters of the two men supplemented each other, as also in the case of Blücher and Gneisenau and that of Radetzky and Hess. Under these circumstances, the German system of command works, on the whole, smoothly. Matters would, however, be different if either of the two officers failed to realize their mutual interdependence, and the system is in any case only required when the self-sufficing great soldier is not available for the chief executive command.

53. *First and Second Lines.*—The organization into arms and units is of course maintained in peace as well as for war. Military forces are further organized, in peace, into active and reserve troops, first and second lines, &c.,

according to the power possessed by the executive over the men. Broadly speaking, the latter fall into three classes, regulars, auxiliary forces and irregular troops. The regulars or active troops are usually liable to serve at all times and in any country to which they may be sent. Auxiliary forces may be defined as all troops which undergo actual military training without being constantly under arms, and in Great Britain these were until 1908 represented by the Militia, the Yeomanry and the Volunteers, and now by the Territorial Force and the Special Reserve. In a country in which recruiting is by voluntary enlistment the classification is, of course, very different from that prevailing in a conscript army. The various "lines" are usually composed of separate organizations; the men are recruited upon different engagements, and receive a varying amount of training. Of the men not permanently embodied, only the reserve of the active army has actually served a continuous term with the colours. Other troops, called by various appellations, of which "militia" may be taken as generic, go through their military training at intervals. The general lines of army organization in the case of a country recruiting by universal service are as follows:—The male population is divided into classes, by ages, and the total period of liability to service is usually about 25 years. Thus at any given time, assuming two years' colour-service, the men of 20 and 21 years of age would constitute the active army serving with the colours, those of, say, 22 and 23, the reserve. The *Landwehr* or second line army would consist of all men who had been through the active army and were now aged 24 to 36. The third line would similarly consist of men whose ages were between 36 and 44. Assuming the same annual levy, the active army would consist of 200,000 men, its reserve 200,000, the second line of 1,300,000, and the third of 800,000. Thus of 2,500,000 men liable to, and trained for, military service, 200,000 only would be under arms at any given time. The simple system here outlined is of course modified and complicated in practice owing to re-engagements by non-commissioned officers, the speedy dismissal to the reserve of intelligent and educated men, &c.

54. *War Reserves.*—In war, the reserves increase the field armies to 400,000 men, the whole or part of the second line is called up and formed into auxiliary regiments, brigades and divisions, and in case of necessity the third line is also called upon, though usually this is only in the last resort and for home defence only. The proportion of reservists to men with the colours varies of course with the length of service. Thus in France or Germany, with two years' service in force, half of the rank and file of a unit in war would be men recalled from civil life. The true military value of reservists is often questioned, and under certain circumstances it is probable that units would take the field at peace strength without waiting for their reservists. The frontier guards of the continental military powers, which are expected to move at the earliest possible moment after hostilities have begun, are maintained at a higher effective than other units, and do not depend to any great extent on receiving reservists. The peace footing of cavalry and artillery units is similarly maintained at an artificial level. An operation of the nature of a *coup de main* would in any case be carried out by the troops available at the moment, however large might be the force required—twenty weak battalions would, in fact, be employed instead of ten strong ones. There is another class of troops, which may be called depot troops. These consist of officers and men left behind when the active corps completed with reserves takes the field, and they have (*a*) to furnish drafts for the front—and (*b*) to form a nucleus upon which all later formations are built up. The troops of the second line undertake minor work, such as guarding railways, and also furnish drafts for the field army. Later, when they have been for some time under arms, the second line troops are often employed by themselves in first line. A year's training under war conditions should bring such troops to the highest efficiency. As for irregulars, they have real military value only when the various permanent establishments do not take up the whole fighting strength of the nation, and thus states having universal service armies do not, as a rule, contemplate the employment of combatants other than those shown on the peace rolls. The status of irregulars is ill defined, but it is practically agreed that combatants, over whose conduct the military authorities have no disciplinary power, should be denied the privileges of recognized soldiers, and put to death if captured. So drastic a procedure is naturally open to abuse and is not always expedient. Still, it is perfectly right that the same man shall not be allowed, for example, to shoot

a sentry at one moment, and to claim the privileges of a harmless civilian at the next. The division into first, second and third lines follows generally from the above. The first line troops, in a conscript army, are the "active army" or regulars, permanently under arms in peace time, and its reserves, which are used on the outbreak of war to complete the existing units to full strength. The German terms *Landwehr* and *Landsturm* are often applied to armies of the second and the third lines.

55. The military characteristics of the various types of regular troops have been dealt with in considering the advantages and disadvantages of the several forms of recruiting. It only remains to give some indication of the advantages which such forces (irrespective of their time of service) possess over troops which only come up for training at intervals. Physically, the men with the colours are always superior to the rest, owing to their constant exercise and the regularity and order under which they live; as soldiers, they are more under the control of their officers, who are their leaders in daily life, in closer touch with army methods and discipline, and, as regards their formal training, they possess infinitely greater power of strategic and tactical manœuvre. Their steadiness under fire is of course more to be relied upon than that of other troops. Wellington, speaking of the contrast between old and young soldiers (regulars), was of opinion that the chief difference lay in the greater hardiness, power of endurance, and general campaigning qualities given by experience. This is of course more than ever true in respect of regular and auxiliary troops, as was strikingly demonstrated in the Spanish-American War. On the whole, it is true to say that only a regular army can endure defeat without dissolution, and that volunteers, reservists or militiamen fresh from civil life may win a victory but cannot make the fullest use of it when won. At the same time, when they have been through one or two arduous campaigns, raw troops become to all intents and purposes equal to any regulars. On the other hand, the greatest military virtue of auxiliary forces is their enthusiasm. With this quality were won the great victories of 1792-94 in France, those of 1813 in Germany, and the beginnings of Italian unity at Calatafimi and Palermo. The earlier days of the American Civil War witnessed desperate fighting, of which Shiloh is the best example, between armies which had had but the slightest military training. In the same war the first battle of Bull Run illustrated what has been said above as to the weaknesses of unprofessional armies. Both sides, raw and untrained, fought for a long time with the greatest determination, after which the defeated army was completely dissolved in rout and the victors quite unable to pursue. So far it is the relative military value of the professional soldier and the citizen-soldier that has been reviewed. A continental army of the French or German stamp is differently constituted. It is, first of all, clear that the drilled citizen-soldier combines the qualities of training and enthusiasm. From this it follows that a hostile "feeling" as well as a hostile "view" must animate such an army if it is to do good service. If a modern "nation in arms" is engaged in a purely dynastic quarrel against a professional army of inferior strength, the result will probably be victory for the latter. But the active army of France or Germany constitutes but a small part of the "nation in arms," and the army for war is composed in addition of men who have at some period in the past gone through a regular training. Herein lies the difference between continental and British auxiliary forces. In the French army, an ex-soldier during his ten years of reserve service was by the law of 1905 only liable for two months' training, and for the rest of his military career for two weeks' service only. The further reduction of this liability was proposed in 1907 and led to much controversy. The question of the value of auxiliary forces, then, as between the continuous work of, say, English territorials, and the permanent though dwindling influence of an original period of active soldiering, is one of considerable importance. It is largely decided in any given case by the average age of the men in the ranks.

56. The transfer of troops from the state of peace to that of war is called *mobilization*. This is, of course, a matter which primarily depends on good administration, and its minutest details are in all states laid down beforehand. Reservists have to be summoned, and, on arrival, to be clothed and equipped out of stores maintained in peace. Officers and men of the regular army on leave have to be recalled, the whole medically examined for physical fitness to serve, and a thousand details have to be worked out before the unit is ready to move to its concentration station. The concentration and the strategic deployment are, of course, dependent upon the circumstances of each

war, and the peace organization ceases to be applicable. But throughout a war the depots at home, the recruiting districts of second-line troops, and above all the various arsenals, manufactories and offices controlled by the war department are continually at work in maintaining the troops in the field at proper strength and effectiveness.

57. *Territorial System.*—The feudal system was of course a territorial system in principle. Indeed, as has been shown above, a feudal army was chiefly at fault owing to the dislocation of the various levies. Concentration was equally the characteristic of the professional armies which succeeded those of feudalism, and only such militia forces as remained in existence preserved a local character. The origin of territorial recruiting for first-line troops is to be found in the "cantonal" system, said to have been introduced by Louis XIV., but brought to the greatest perfection in Prussia under Frederick William I. But long service and the absence of a reserve vitiated the system in practice, since losses had to be made good by general recruiting, and even the French Revolution may hardly be said to have produced the territorial system as we understand it to-day. It was only in the deliberate preparation of the Prussian army on short-service lines that we find the beginning of the "territorial system of dislocation and command." This is so intimately connected with the general system of organization that it cannot be considered merely as a method of recruiting by districts. It may be defined as a system whereby, for purposes of command in peace, recruiting, and of organization generally, the country is divided into districts, which are again divided and subdivided as may be required. In a country in which universal service prevails, an army corps district is divided into divisional districts, these being made up of brigade and of regimental districts. Each of these units recruits, and is in peace usually stationed, in its own area; the artillery, cavalry and special arms are recruited for the corps throughout the whole allotted area, and stationed at various points within the same. Thus in the German army the III. army corps is composed entirely of Brandenburgers. The infantry of the corps is stationed in ten towns, the cavalry in four and the artillery in five. In countries which adhere to voluntary recruiting, the system, depending as it does on the calculable certainty of recruiting, is not so fully developed, but in Great Britain the auxiliary forces have been reorganized in divisions of all arms on a strictly territorial basis. The advantage of the system as carried into effect in Germany is obvious. Training is carried out with a minimum of friction and expense, as each unit has an ample area for training. Whilst the brigadiers can exercise general control over the colonels, and the divisional generals over the brigadiers, there is little undue interference of superior authority in the work of each grade, and the men, if soldiers by compulsion, at any rate are serving close to their own homes. Most of the reservists required on mobilization reside within a few miles of their barracks. Living in the midst of the civil population, the troops do not tend to become a class apart. Small garrisons are not, as formerly, allowed to stagnate, since modern communications make supervision easy. Further, it must be borne in mind that the essence of the system is the organization and training for war of the whole military population. Now so great a mass of men could not be administered except through this decentralization of authority, and the corollary of short service universally applied is the full territorial system, in which the whole enrolled strength of the district is subjected to the authority of the district commander. Practice, however, falls short of theory, and the dangers of drawing whole units from disaffected or unmilitary districts are often foreseen and discounted by distributing the recruits, non-regionally, amongst more or less distant regiments.

58. *Army Administration.*—The existing systems of command and organization, being usually based upon purely military considerations, have thus much, indeed almost all, in common. *Administration* differs from them in one important respect. While the methods of command and organization are the result of the accumulated experience of many armies through many hundred years, the central administration in each case is the product of the historical evolution of the particular country, and is dependent upon forms of government, constitutions and political parties. Thus France, after 1870, remodelled the organization of her forces in accordance with the methods which were presumed to have given Germany the victory, but the headquarters staff at Paris is very different in all branches from that of Berlin. Great Britain adopted German tactics, and to some extent even uniform, but the Army Council has no counterpart in the administration of the German emperor's forces.

The first point for consideration, therefore, is, what is the ultimate, and what is the proximate, authority supervising the administration? The former is, in most countries, the people or its representatives in parliament, for it is in their power to stop supplies, and without money the whole military fabric must crumble. The constitutional chief of the army is the sovereign, or, in republics, the president, but in most countries the direct control of army matters by the representatives of the people extends over all affairs into which the well-being of the civil population, the expenditure of money, alleged miscarriages of military justice, &c., enter, and it is not unusual to find grand strategy, and even the technical deficiencies of a field-gun or rifle, the subject of interpellation and debate. The peculiar influence of the sovereign is in what may be termed patronage (that is, the selection of officers to fill important positions and the general supervision of the officer-corps), and in the fact that loyalty is the foundation of the discipline and soldierly honour which it is the task of the officers to inculcate into their men. In all cases the head of the state is *ipso facto* the head of the army. The difference between various systems may then be held to depend on the degree of power allowed to or held by him. This reacts upon the central administration of the army, and is the cause of the differences of system alluded to. For the civil chief of the executive is not necessarily a soldier, much less an expert and capable soldier; he must, therefore, be provided with technical advisers. The chief of the general staff is often the principal of these, though in some cases a special commander-in-chief, or the minister for war, or, as in France and England, a committee or council, has the duty of advising the executive on technical matters.

59. *Branches of Administration.*—In these circumstances the only general principle of army administration common to all systems is the division of the labour between two great branches. Military administration, in respect of the troops and material which it has to control, is divided between the departments of the *War Office* and the *General Staff*. In the staff work of subordinate units, *e.g.* army corps and divisions, the same classification of duties is adopted, "general staff" duties being performed by one set of officers, "routine staff" duties by another.

The work of a *General Staff* may be taken as consisting in preparation for war, and this again, both in Great Britain and abroad, consists of military policy in all its branches, staff duties in war, the collection of intelligence, mobilization, plans of operations and concentration, training, military history and geography, and the preparation of war regulations. These subjects are usually subdivided into four or five groups, each of which is dealt with by a separate section of the general staff, the actual division of the work, of course, varying in different countries. Thus, the second section of the French staff deals with "the organization and tactics of foreign armies, study of foreign theatres of war, and military missions abroad." A *War Office* is concerned with peace administration and with the provision of men and material in war. Under the former category fall such matters as "routine" administration, finance, justice, recruiting, promotion of officers (though not always), barracks and buildings generally, armament, equipment and clothing, &c., in fact all matters not directly relevant to the training of the troops for and the employment of the troops in war. In war, some of the functions of a war office are suspended, but on the other hand the work necessary for the provision of men and material to augment the army and to make good its losses is vastly increased. In 1870 the minister of war, von Roon, accompanied the headquarters in the field, but this arrangement did not work well, and will not be employed again. The chief duties other than those of the general staff fall into two classes, the "routine staff," administration or adjutant-general's branch, which deals with all matters affecting *personnel*, and the quartermaster-general's branch, which supervises the provision and issue of supplies, stores and *matériel* of all kinds. Over and above these, provision has to be made for control of all the technical parts of administration, such as artillery and engineer services (in Great Britain, this, with a portion of the quartermaster-general's department, is under the master-general of the ordnance), and for military legislation, preparation of estimates, &c. These are, of course, special subjects, not directly belonging to the general administrative system. It is only requisite that the latter should be sufficiently elastic to admit of these departments being formed as required. However these subordinate offices may be multiplied, the main work of the war office is in the two departments of the adjutant-general (*personnel*) and the quartermaster-general (*matériel*). Beyond and

wholly distinct from these is the general staff, the creation of which is perhaps the most important contribution of the past century to the pure science of military organization.

Comparative Strength of Various Armies

(*a*) *Compulsory Service* (1906).

	France.	Germany.	Russia.	Austri Hungar
Annual Contingent for the Colours	230,000	222,000	254,000	128,
Medically unfit and exempt	90,000	127,000	120,000	57,
Excused from Service in Peace, able-bodied	. .	291,000	606,000	285,
Total of Men becoming liable for service in 1907	320,000	540,000	980,000	470,
Total Permanent Armed Force in Peace	610,000 (not includ-ding colonial troops)	610,000	1,226,000	356,
First-Line Troops, war-strength (estimated)	1,350,000	1,675,000	2,187,000	950,
Second-Line Troops, war-strength (estimated)	3,000,000	2,275,000	1,429,000	1,450,
Numbers available in excess of these (estimated)	450,000	3,950,000	9,384,000	5,000,
Total War Resources of all kinds	4,800,000	7,900,000	13,000,000	7,400,
Annual Military Expenditure—total	£27,720,000	£32,228,000	£36,080,000	£15,840,
Annual Military Expenditure—per head of population (approx.)	13s. 9d.	10s. 9d.	5s. 3d.	6s. 8d

(*b*) *Authorized Establishments and Approximate Military Resources of the British Empire* (1906-1907).

	British Regular Army.	Reserves for Regular Army.	Auxiliary Forces.	Native Troops (Regular, Reserve, &c.).
Great Britain	117,000	120,000	500,000	. .
Channel Islands, Malta, Bermuda, Colonies and Dependencies	65,000	. .	6,000	. .
India	75,000	. .	30,000	202,000
Canadian Forces	. .	. .	46,000	. .
Australian Forces (including New Zealand)	. .	. .	70,000 (appr.)	. .
South African Forces	. .	. .	20,000 (appr.)	. .
Totals	257,000	120,000	672,000	202,000

Note.—Ex-soldiers of regular and auxiliary forces, still fit for service, and estimated *levées en masse*, are not counted. Enlistment chiefly voluntary.

(*c*) The Regular Army of the United States has a maximum authorized establishment (1906) of 60,000 enlisted men; the Organized Militia was at the same date 110,000 strong. Voluntary enlistment throughout. (See UNITED STATES.) In 1906-1907 the total numbers available for a *levée en masse* were estimated at 13,000,000.

BRITISH ARMY

60. Prior to the Norman Conquest the armed force of England was essentially a national militia. Every freeman was bound to bear arms for the defence of the country, or for the maintenance of order. To give some organization and training to the levy, the several sheriffs had authority to call out the contingents of their shires for exercise. The "fyrd," as the levy was named, was available for home service only, and could not be moved even from its county except in the case of emergency; and it was principally to repel oversea invasions that its services were required. Yet even in those days the necessity of some more permanent force was felt, and bodies of paid troops were maintained by the kings at their own cost. Thus Canute and his successors, and even some of the great earls kept up a household force (*huscarles*). The English army at Hastings consisted of the *fyrd* and the corps of *huscarles*.

The English had fought on foot; but the mailed horseman had now become the chief factor in war, and the Conqueror introduced into England the system of tenure by knight-service familiar in Normandy. This was based on the unit of the feudal host, the *constabularia* of ten knights, the Conqueror granting lands in return for finding one or more of these units (in the case of great barons) or some fraction of them (in the case of lesser tenants). The obligation was to provide knights to serve, with horse and arms, for forty days in each year at their own charges. This obligation could be handed on by sub-enfeoffment through a whole series of under-tenants. The system being based, not on the duty of personal service, but on the obligation to supply one or more knights (or it might be only the fraction of a knight), it was early found convenient to commute this for a money payment known as "scutage" (see KNIGHT SERVICE and SCUTAGE). This money enabled the king to hire mercenaries, or pay such of the feudal troops as were willing to serve beyond the usual time. From time to time proclamations and statutes were issued reminding the holders of knights' fees of their duties; but the immediate object was generally to raise money rather than to enforce personal service, which became more and more rare. The feudal system had not, however, abrogated the old Saxon levies, and from these arose two national institutions—the *posse comitatus*, liable to be called out by the sheriff to maintain the king's peace, and later the *militia* (*q.v.*). The *posse comitatus*, or power of the county, included all males able to bear arms, peers and spiritual men excepted; and though primarily a police force it was also bound to assist in the defence of the country. This levy was organized by the Assize of Arms under Henry II. (1181), and subsequently under Edward I. (1285) by the so-called "Statute of Winchester," which determined the numbers and description of weapons to be kept by each man according to his property, and also provided for their periodical inspection. The early Plantagenets made free use of mercenaries. But the weakness of the feudal system in England was preparing, through the 12th and 13th centuries, a nation in arms absolutely unique in the middle ages. The Scottish and Welsh wars were, of course, fought by the feudal levy, but this levy was far from being the mob of unwilling peasants usual abroad, and from the *fyrd* came the English archers, whose fame was established by Edward I.'s wars, and carried to the continent by Edward III. Edward III. realized that there was better material to be had in his own country than abroad, and the army with which he invaded France was an army of national mercenaries, or, more simply, of English soldiers. The army at Creçy was composed exclusively of English, Welsh and Irish. From the pay list of the army at the siege of Calais (1346) it appears that all ranks, from the prince of Wales downward, were paid, no attempt being made to force even the feudal nobles to

serve abroad at their own expense. These armies were raised mainly by contracts entered into "with some knight or gentleman expert in war, and of great revenue and livelihood in the country, to serve the king in war with a number of men." Copies of the indentures executed when Henry V. raised his army for the invasion of France in 1415 are in existence. Under these the contracting party agreed to serve the king abroad for one year, with a given number of men equipped according to agreement, and at a stipulated rate of pay. A certain sum was usually paid in advance, and in many cases the crown jewels and plate were given in pledge for the rest. The profession of arms seems to have been profitable. The pay of the soldier was high as compared with that of the ordinary labourer, and he had the prospect of a share of plunder in addition, so that it was not difficult to raise men where the commander had a good military reputation. Edward III. is said to have declined the services of numbers of foreign mercenaries who wished to enrol under him in his wars against France.

The funds for the payment of these armies were provided partly from the royal revenues, partly from the fines paid in lieu of military service, and other fines arbitrarily imposed, and partly by grants from parliament. As the soldier's contract usually ended with the war, and the king had seldom funds to renew it even if he so wished, the armies disbanded of themselves at the close of each war. To secure the services of the soldier during his contract, acts were passed (18 Henry VI. c. 19; and 7 Henry VII. c. 1) inflicting penalties for desertion; and in Edward VI.'s reign an act "touching the true service of captains and soldiers" was passed, somewhat of the nature of a Mutiny Act.

61. It is difficult to summarize the history of the army between the Hundred Years' War and 1642. The final failure of the English arms in France was soon followed by the Wars of the Roses, and in the long period of civil strife the only national force remaining to England was the Calais garrison. Henry VIII. was a soldier-king, but he shared the public feeling for the old bow and bill, and English armies which served abroad did not, it seems, win the respect of the advanced professional soldiers of the continent. In 1519 the Venetian ambassador described the English forces as consisting of 150,000 men whose peculiar, though not exclusive, weapon was the long bow (Fortescue i. 117). The national levy made in 1588 to resist the Armada and the threat of invasion produced about 750 lancers (heavy-armed cavalry), 2000 light horse and 56,000 foot, beside 20,000 men employed in watching the coasts. The small proportion of mounted men is very remarkable in a country in which Cromwell was before long to illustrate the full power of cavalry on the battlefield. It is indeed not unfair to regard this army as a miscellaneous levy of inferior quality.

It was in cavalry that England was weakest, and by three different acts it was sought to improve the breed of horses, though the light horse of the northern counties had a good reputation, and even won the admiration of the emperor Charles V. Perhaps the best organized force in England at this time was the London volunteer association which ultimately became the Honourable Artillery Company. At Floddon the spirit of the old English yeomanry triumphed over the outward form of continental battalions which the Scots had adopted, and doubtless the great victory did much to retard military progress in England. The chief service of Henry VIII. to the British army was the formation of an artillery train, in which he took a special interest. Before he died the forces came to consist of a few permanent troops (the bodyguard and the fortress artillery service), the militia or general levy, which was for home, and indeed for county, service only, and the paid armies which were collected for a foreign war and disbanded at the conclusion of peace, and were recruited on the same principle of indents which had served in the Hundred Years' War. In the reign of Mary, the old Statute of Winchester was revised (1553), and the new act provided for a readjustment of the county contingents and in some degree for the rearmament of the militia. But, from the fall of Calais and the expedition to Havre up to the battle of the Dunes a century later, the intervention of British forces in foreign wars was always futile and generally disastrous. During this time, however, the numerous British regiments in the service of Holland learned, in the long war of Dutch independence, the art of war as it had developed on the continent since 1450, and assimilated the regimental system and the drill and armament of the

best models. Thus it was that in 1642 there were many hundreds of trained and war-experienced officers and sergeants available for the armies of the king and the parliament. By this time bows and bills had long disappeared even from the militia, and the Thirty Years' War, which, even more than the Low Countries, offered a career for the adventurous man, contributed yet more trained officers and soldiers to the English and Scottish forces. So closely indeed was war now studied by Englishmen that the respective adherents of the Dutch and the Swedish systems quarrelled on the eve of the battle of Edgehill. Francis and Horace Vere, Sir John Norris, and other Englishmen had become generals of European reputation. Skippon, Astley, Goring, Rupert, and many others soon to be famous were distinguished as company and regimental officers in the battles and sieges of Germany and the Low Countries.

The home forces of England had, as has been said, little or nothing to revive their ancient renown. Instead, they had come to be regarded as a menace to the constitution. In Queen Elizabeth's time the demands of the Irish wars had led to frequent forced levies, and the occasional billeting of the troops in England also gave rise to murmurs, but the brilliancy and energy of her reign covered a great deal, and the peaceful policy of her successor removed all immediate cause of complaint. But after the accession of Charles I. we find the army a constant and principal source of dispute between the king and parliament, until under William III. it is finally established on a constitutional footing. Charles, wishing to support the Elector Palatine in the Thirty Years' War, raised an army of 10,000 men. He was already encumbered with debts, and the parliament refused all grants, on which he had recourse to forced loans. The army was sent to Spain, but returned without effecting anything, and was not disbanded, as usual, but billeted on the inhabitants. The billeting was the more deeply resented as it appeared that the troops were purposely billeted on those who had resisted the loan. Forced loans, billeting and martial law—all directly connected with the maintenance of the army—formed the main substance of the grievances set forth in the Petition of Right. In accepting this petition, Charles gave up the right to maintain an army without consent of parliament; and when in 1639 he wished to raise one to act against the rebellious Scots, parliament was called together, and its sanction obtained, on the plea that the army was necessary for the defence of England. This army again became the source of dispute between the king and parliament, and finally both sides appealed to arms.

62. The first years of the Great Rebellion (*q.v.*) showed primarily the abundance of good officers produced by the wars on the continent, and in the second place the absolute inadequacy of the military system of the country; the commissions of array, militia ordinances, &c., had at last to give way to regular methods of enlistment and a central army administration. It was clear, at the same time, that when the struggle was one of principles and not of dynastic politics, excellent recruits, far different from the wretched levies who had been gathered together for the Spanish war, were to be had in any reasonable number. These causes combined to produce the "New Model" which, originating in Cromwell's own cavalry and the London trained bands of foot, formed of picked men and officers, severely disciplined, and organized and administered in the right way, quickly proved its superiority over all other armies in the field, and in a few years raised its general to supreme civil power. The 15th of February 1645 was the birthday of the British standing army, and from its first concentration at Windsor Park dates the scarlet uniform. The men were for the most part voluntarily enlisted from existing corps, though deficiencies had immediately to be made good by impressment.

Four months later the New Model decided the quarrel of king and parliament at Naseby. When Cromwell, the first lieutenant-general and the second captain-general of the army, sent his veterans to take part in the wars of the continent they proved themselves a match for the best soldiers in Europe. On the restoration of the monarchy in 1660 the army, now some 80,000 strong, was disbanded. It had enforced the execution of Charles I., it had dissolved parliament, and England had been for years governed under a military regime. Thus the most popular measure of the Restoration was the dissolution of the army. Only Monk's regiment of foot (now the Coldstream Guards) survived to represent the New Model in the army of to-day. At the same time the troops (now regiments)

of household cavalry, and the regiment of foot which afterwards became the Grenadier Guards, were formed, chiefly from Royalists, though the disbanded New Model contributed many experienced recruits. The permanent forces of the crown came to consist once more of the "garrisons and guards," maintained by the king from the revenue allotted to him for carrying on the government of the country. The "garrisons" were commissioned to special fortresses—the Tower of London, Portsmouth, &c. The "guards" comprised the sovereign's bodyguards ("the yeomen of the guard" and "gentlemen-at-arms," who had existed since the times of Henry VII. and VIII.), and the regiments mentioned above. Even this small force, at first not exceeding 3000 men, was looked on with jealousy by parliament, and every attempt to increase it was opposed. The acquisition of Tangier and Bombay, as part of the dower of the infanta of Portugal, led to the formation of a troop of horse (now the 1st Royal Dragoons) and a regiment of infantry (the 2nd, now Queen's R.W. Surrey, regiment) for the protection of the former; and a regiment of infantry (afterwards transferred to the East India Company) to hold the latter (1661). These troops, not being stationed in the kingdom, created no distrust; but whenever, as on several occasions during Charles's reign, considerable armies were raised, they were mostly disbanded when the occasion ceased. Several regiments, however, were added to the permanent force, including Dumbarton's regiment (the 1st or Royal Scots, nicknamed Pontius Pilate's Bodyguard)—which had a long record of service in the armies of the continent, and represented the Scots brigade of Gustavus Adolphus's army—and the 3rd Buffs, representing the English regiments of the Dutch army and through them the volunteers of 1572, and on Charles's death in 1685 the total force of "guards and garrisons" had risen to 16,500, of whom about one-half formed what we should now call the standing army.

63. James II., an experienced soldier and sailor, was more obstinate than his predecessor in his efforts to increase the army, and Monmouth's rebellion afforded him the opportunity. A force of about 20,000 men was maintained in England, and a large camp formed at Hounslow. Eight cavalry and twelve infantry regiments (the senior of which was the 7th "Royal" Fusiliers, formed on a new French model) were raised, and given the numbers which, with few exceptions, they still bear. James even proposed to disband the militia, which had not distinguished itself in the late rebellion, and further augment the standing army; and although the proposal was instantly rejected, he continued to add to the army till the Revolution deprived him of his throne. The army which he had raised was to a great extent disbanded, the Irish soldiers especially, whom he had introduced in large numbers on account of their religion, being all sent home.

The condition of the army immediately engaged the attention of parliament. The Bill of Rights had definitely established that "the raising or keeping of a standing army within the kingdom, unless it be by the consent of parliament, is against the law," and past experience made them very jealous of such a force. But civil war was imminent, foreign war certain; and William had only a few Dutch troops, and the remains of James's army, with which to meet the storm. Parliament therefore sanctioned a standing army, trusting to the checks established by the Bill of Rights and Act of Settlement, and by placing the pay of the army under the control of the Commons. An event soon showed the altered position of the army. A regiment mutinied and declared for James. It was surrounded and compelled to lay down its arms; but William found himself without legal power to deal with the mutineers. He therefore applied to parliament, and in 1689 was passed the first Mutiny Act, which, after repeating the provisions regarding the army inserted in the Bill of Rights, and declaring the illegality of martial law, gave power to the crown to deal with the offences of mutiny and desertion by courts-martial. From this event is often dated the history of the standing army as a constitutional force (but see Fortescue, *British Army*, i. 335).

64. Under William the army was considerably augmented. The old regiments of James's army were reorganized, retaining, however, their original numbers, and three of cavalry and eleven of infantry (numbered to the 28th) were added. In 1690 parliament sanctioned a force of 62,000 men, further increased to 65,000 in 1691; but on peace being made in 1697 the Commons immediately passed resolutions to the effect that the land forces be reduced to 7000 men in England and 12,000 in Ireland. The War of the Spanish Succession quickly obliged Great Britain

again to raise a large army, at one time exceeding 200,000 men; but of these the greater number were foreign troops engaged for the continental war. Fortescue (*op. cit.* i. 555) estimates the British forces at home and abroad as 70,000 men at the highest figure. After the peace of Utrecht the force was again reduced to 8000 men in Great Britain and 11,000 in the plantations (*i.e.* colonies) and abroad. From that time to the present the strength of the army has been determined by the annual votes of parliament, and though frequently the subject of warm debates in both houses, it has ceased to be a matter of dispute between the crown and parliament. The following table shows the fluctuations from that time onward—the peace years showing the average peace strength, the war years the maximum to which the forces were raised:—

Peace.		War.	
Year.	Number.	Year.	Number.
1750	18,857	1745	74,187
1793	17,013	1761	67,776
1822	71,790	1777	90,734
1845	100,011	1812	245,996
1857	156,995	1856	275,079
1866	203,404	1858	222,784

Note.—Prior to 1856 the British forces serving in India are not included.

During William's reign the small English army bore an honourable part in the wars against Louis XIV., and especially distinguished itself under the king at Steinkirk, Neerwinden and Namur. Twenty English regiments took part in the campaign of 1694. In the great wars of Queen Anne's reign the British army under Marlborough acquired a European reputation. The cavalry, which had called forth the admiration of Prince Eugene when passed in review before him after its long march across Germany (1704), especially distinguished itself in the battle of Blenheim, and Ramillies, Oudenarde and Malplaquet were added to the list of English victories. But the army as usual was reduced at once, and even the cadres of old regiments were disbanded, though the alarm of Jacobite insurrections soon brought about the re-creation of many of these. During the reign of the first and second Georges an artillery corps was organized, and the army further increased by five regiments of cavalry and thirty-five of infantry. Fresh laurels were won at Dettingen (1743), in which battle twenty English regiments took part; and though Fontenoy (*q.v.*) was a day of disaster for the English arms, it did not lower their reputation, but rather added to it. Six regiments of infantry won the chief glory of Prince Ferdinand's victory of Minden (*q.v.*) in 1759, and throughout the latter part of the Seven Years' War the British contingent of Ferdinand's army served with almost unvarying distinction in numerous actions. About this time the first English regiments were sent to India, and the 39th shared in Clive's victory at Plassey. During the first half of George III.'s reign the army was principally occupied in America; and though the conquest of Canada may be counted with pride among its exploits, this page in its history is certainly the darkest. English armies capitulated at Saratoga and at Yorktown, and the war ended by the evacuation of the revolted states of America and the acknowledgment of their independence.

65. Before passing to the great French Revolutionary wars, from which a fresh period in the history of the army may be dated, it will be well to review the general condition of the army in the preceding century, injured as it was by the distrust of parliament and departmental weakness and corruption which went far to neutralize the good work of the duke of Cumberland as commander-in-chief and of Pitt as war administrator. Regiments were raised almost as in the days of the Edwards. The crown contracted with a distinguished soldier, or gentleman of high position, who undertook to raise the men, receiving a certain sum as bounty-money for each recruit. In some cases, in lieu of money, the contractor received the nomination of all or some of the officers, and recouped himself by selling the commissions. This system—termed "raising men for rank"—was retained for many years, and originally helped to create the "purchase system" of promotion. For the maintenance of the regiment the colonel received an annual

sum sufficient to cover the pay of the men, and the expenses of clothing and of recruiting. The colonel was given a "beating order," without which no enlistment was legal, and was responsible for maintaining his regiment at full strength. "Muster masters" were appointed to muster the regiments, and to see that the men for whom pay was drawn were really effective. Sometimes, when casualties were numerous, the allowance was insufficient to meet the cost of recruiting, and special grants were made. In war time the ranks were also filled by released debtors, pardoned criminals, and impressed paupers and vagrants. Where the men were raised by voluntary enlistment, the period of service was a matter of contract between the colonel and the soldier, and the engagement was usually for life; but exceptional levies were enlisted for the duration of war, or for periods of three or five years. As for the officers, the low rate of pay and the purchase system combined to exclude all but men of independent incomes. Appointments (except when in the gift of the colonel) were made by the king at home, and by the commander-in-chief abroad; even in Ireland the power of appointment rested with the local commander of the forces until the Union. The soldier was clothed by his colonel, the charge being defrayed from the "stock fund." The army lived in barracks, camps or billets. The barrack accommodation in Great Britain at the beginning of the 18th century only sufficed for five thousand men; and though it had gradually risen to twenty thousand in 1792, a large part of the army was constantly in camps and billets—the latter causing endless complaints and difficulties.

66. The first efforts of the army in the long war with France did not tend to raise its reputation amongst the armies of Europe. The campaigns of allied armies under the duke of York in the Netherlands, in which British contingents figured largely, were uniformly unsuccessful (1793-94 and 1799), though in this respect they resembled those of almost all soldiers who commanded against the "New French" army. The policy of the younger Pitt sent thousands of the best soldiers to unprofitable employment, and indeed to death, in the West Indies. At home the administration was corrupt and ineffective, and the people generally shared the contemptuous feeling towards the regular army which was then prevalent in Europe. But a better era began with the appointment of Frederick Augustus, duke of York, as commander-in-chief of the army. He did much to improve its organization, discipline and training, and was ably seconded by commanders of distinguished ability. Under Abercromby in Egypt, under Stuart at Maida, and under Lake, Wellesley and others in India, the British armies again attached victory to their standards, and made themselves feared and respected. Later, Napoleon's threat of invading England excited her martial spirit to the highest pitch to which it had ever attained. Finally, her military glory was raised by the series of successful campaigns in the Peninsula, until it culminated in the great victory of Waterloo; and the army emerged from the war with the most solidly founded reputation of any in Europe.

The events of this period belong to the history of Europe, and fall outside the province of an article dealing only with the army. The great augmentations required during the war were effected partly by raising additional regiments, but principally by increasing the number of battalions, some regiments being given as many as four. On the conclusion of peace these battalions were reduced, but the regiments were retained, and the army was permanently increased from about twenty thousand, the usual peace establishment before the war, to an average of eighty thousand. The duke of York, on first appointment to the command, had introduced a uniform drill throughout the army, which was further modified according to Sir David Dundas's system in 1800; and, under the direction of Sir John Moore and others, a high perfection of drill was attained. At the beginning of the war, the infantry, like that of the continental powers, was formed in three ranks; but a two-rank formation had been introduced in America and in India and gradually became general, and in 1809 was finally approved. In the Peninsula the army was permanently organized in divisions, usually consisting of two brigades of three or four battalions each, and one or two batteries of artillery. The duke of Wellington had also brought the commissariat and the army transport to a high pitch of perfection, but in the long peace which followed these establishments were reduced or broken up.

67. The period which elapsed between Waterloo and the Crimean War is marked by a number of Indian and colonial wars, but by no organic changes in the army, with perhaps the single exception of the Limited Service Act of 1847, by which enlistment for ten or twelve years, with power to re-engage to complete twenty-one, was substituted for the life enlistments hitherto in force. The army went to sleep on the laurels and recollections of the Peninsula. The duke of Wellington, for many years commander-in-chief, was too anxious to hide it away in the colonies in order to save it from further reductions or utter extinction, to attempt any great administrative reforms. The force which was sent to the Crimea in 1854 was an agglomeration of battalions, individually of the finest quality, but unused to work together, without trained staff, administrative departments or army organization of any kind. The lesson of the winter before Sevastopol was dearly bought, but was not thrown away. From that time successive war ministers and commanders-in-chief have laboured perseveringly at the difficult task of army organization and administration. Foremost in the work was Sidney Herbert (Lord Herbert of Lea), the soldier's friend, who fell a sacrifice to his labours (1861), but not before he had done much for the army. The whole system of administration was revised. In 1854 it was inconceivably complicated and cumbersome. The "secretary of state for war and colonies," sitting at the Colonial Office, had a general but vague control, practically limited to times of war. The "secretary at war" was the parliamentary representative of the army, and exercised a certain financial control, not extending, however, to the ordnance corps. The commander-in-chief was responsible to the sovereign alone in all matters connected with the discipline, command or patronage of the army, but to the secretary at war in financial matters. The master-general and board of ordnance were responsible for the supply of material on requisition, but were otherwise independent, and had the artillery and engineers under them. The commissariat department had its headquarters at the treasury, and until 1852 the militia were under the home secretary. A number of minor subdepartments, more or less independent, also existed, causing endless confusion, correspondence and frequent collision. In 1854 the business of the colonies was separated from that of war, and the then secretary of state, the duke of Newcastle, assumed control over all the other administrative officers. In the following year the secretary of state was appointed secretary at war also, and the duties of the two offices amalgamated. The same year the commissariat office was transferred to the war department, and the Board of Ordnance abolished, its functions being divided between the commander-in-chief and the secretary of state. The minor departments were gradually absorbed, and the whole administration divided under two great chiefs, sitting at the war office and Horse Guards respectively. In 1870 these two were welded into one, and the war office now existing was constituted.

Corresponding improvements were effected in every branch. The system of clothing the soldiers was altered, the contracts being taken from the colonels of regiments, who received a money allowance instead, and the clothing supplied from government manufactories. The pay, food and general condition of the soldier were improved; reading and recreation rooms, libraries, gymnasia and facilities for games of all kinds being provided. Barracks (*q.v.*) were built on improved principles, and a large permanent camp was formed at Aldershot, where considerable forces were collected and manœuvred together. Various educational establishments were opened, a staff college was established for the instruction of officers wishing to qualify for the staff, and regimental schools were improved.

68. The Indian Mutiny of 1857, followed by the transference of the government of India, led to important changes. The East India Company's white troops were amalgamated with the Queen's army, and the whole reorganized (see *Indian Army* below).

The fact that such difficulties as those of 1854 and 1857, not to speak of the disorders of 1848, had been surmounted by the weak army which remained over from the reductions of forty years, coupled with the instantaneous and effective rejoinder to the threats of the French colonels in 1859—the creation of the Volunteer Force—certainly lulled the nation and its representatives into a false sense of security. Thus the two obvious

lessons of the German successes of 1866 and 1870—the power of a national army for offensive invasion, and the rapidity with which such an army when thoroughly organized could be moved—created the greatest sensation in England. The year 1870 is, therefore, of prime importance in the history of the regular forces of the crown. The strength of the home forces at different times between 1815 and 1870 is given as follows (Biddulph, *Lord Cardwell at the War Office*):—

	Regulars.	Auxiliaries.	Field Guns.
1820	64,426	60,740	22
1830	50,876	34,614	30
1840	53,379	20,791	30
1850	68,538	29,868	70
1860	100,701	229,301	180
1870	89,051 (later 109,000)	281,692	180

69. The period of reform commences therefore with 1870, and is connected indissolubly with the name of Edward, Lord Cardwell, secretary of state for war 1869-1874. In the matter of organization the result of his labours was seen in the perfectly arranged expedition to Ashanti (1874); as for recruiting, the introduction of short service and reserve enlistment together with many rearrangements of pay, &c., proved so far popular that the number of men annually enlisted was more than trebled (11,742 in 1869; 39,971 in 1885; 40,729 in 1898), and so far efficient that "Lord Cardwell's ... system, with but small modification, gave us during the Boer War 80,000 reservists, of whom 96 or 97% were found efficient, and has enabled us to keep an army of 150,000 regulars in the field for 15 months" (Rt. Hon. St John Brodrick, House of Commons, 8th of March 1901). The localization of the army, subsequently completed by the territorial system of 1882, was commenced under Cardwell's régime, and a measure which encountered much powerful opposition at the time, the abolition of the purchase of commissions, was also effected by him (1871). The machinery of administration was improved, and autumn manœuvres were practised on a scale hitherto unknown in England. In 1871 certain powers over the militia, formerly held by lords-lieutenant, were transferred to the crown, and the auxiliary forces were placed directly under the generals commanding districts. In 1881 came an important change in the infantry of the line, which was entirely remodelled in two-battalion regiments bearing territorial titles. This measure (the "linked battalion" system) aroused great opposition; it was dictated chiefly by the necessity of maintaining the Indian and colonial garrisons at full strength, and was begun during Lord Cardwell's tenure of office, the principle being that each regiment should have one battalion at home and one abroad, the latter being fed by the former, which in its turn drew upon the reserve to complete it for war. The working of the system is to be considered as belonging to present practice rather than to history, and the reader is therefore referred to the article UNITED KINGDOM. On these general lines the army progressed up to 1899, when the Boer War called into the field on a distant theatre of war all the resources of the regular army, and in addition drew largely upon the existing auxiliary forces, and even upon wholly untrained civilians, for the numbers required to make war in an area which comprised nearly all Africa south of the Zambezi. As the result of this war (see TRANSVAAL) successive schemes of reform were undertaken by the various war ministers, leading up to Mr Haldane's "territorial" scheme (1908), which put the organization of the forces in the United Kingdom (*q.v.*) on a new basis.

Innovations had not been unknown in the period immediately preceding the war; as a single example we may take the development of the mounted infantry (*q.v.*). It was natural that the war itself, and especially a war of so peculiar a character, should intensify the spirit of innovation. The corresponding period in the German army lasted from 1871 to 1888, and such a period of unsettlement is indeed the common, practically the universal, result of a

war on a large scale. Much that was of value in the Prussian methods, faithfully and even slavishly copied by Great Britain as by others after 1870, was temporarily forgotten, but the pendulum swung back again, and the Russo-Japanese War led to the disappearance, so far as Europe was concerned, of many products of the period of doubt and controversy which followed the struggle in South Africa. Side by side with continuous discussions of the greater questions of military policy, amongst these being many well-reasoned proposals for universal service, the technical and administrative efficiency of the service has undergone great improvement, and this appears to be of more real and permanent value than the greater part of the solutions given for the larger problems. The changes in the organization of the artillery afford the best evidence of this spirit of practical and technical reform. In the first place the old "royal regiment" was divided into two branches. The officers for the field and horse artillery stand now on one seniority list for promotion, the garrison, heavy and mountain batteries on another. In each branch important changes of organization have been also made. In the field branch, both for Royal Field and Royal Horse Artillery, the battery is no longer the one unit for all purposes. A lieutenant-colonel's command, the "brigade," has been created. It consists of a group, in the horse artillery of two, in the field artillery of three batteries. For the practical training of the horse and field artillery a large area of ground on the wild open country of Dartmoor, near Okehampton, has for some years been utilized. A similar school has been started at Glen Imaal in Ireland, and a new training ground has been opened on Salisbury Plain. Similarly, with the Royal Garrison Artillery a more perfect system has been devised for the regulation and practice of the fire of each fortress, in accordance with the varying circumstances of its position, &c. A practice school for the garrison artillery has been established at Lydd, but the various coast fortresses themselves carry out regular practice with service ammunition.

Indian Army

70. Historically, the Indian army grew up in three distinct divisions, the Bengal, Madras and Bombay armies. This separation was the natural result of the original foundation of separate settlements and factories in India; and each retains to the present day much of its old identity.

Bengal.—The English traders in Bengal were long restricted by the native princes to a military establishment of an ensign and 30 men; and this force may be taken as the germ of the Indian army. In 1681 Bengal received the first reinforcement from Madras, and two years later a company was sent from Madras, raising the little Bengal army to a strength of 250 Europeans. In 1695 native soldiers were first enlisted. In 1701-1702 the garrison of Calcutta consisted of 120 soldiers and seamen gunners. In 1756 occurred the defence of Calcutta against Suraj-ud-Dowlah, and the terrible tragedy of the Black Hole. The work of reconquest and punishment was carried out by an expedition from Madras, and in the little force with which Clive gained the great victory of Plassey the Bengal army was represented by a few hundred men only (the British 39th, now Dorsetshire regiment, which was also present, was the first King's regiment sent to India, and bears the motto *Primus in Indis*); but from this date the military power of the Company rapidly increased. A company of artillery had been organized in 1748; and in 1757, shortly before Plassey, the 1st regiment of Bengal native infantry was raised. Next, in 1759 the native infantry was augmented, in 1760 dragoons were raised, and in 1763 the total forces amounted to 1500 Europeans and 12 battalions of native infantry (11,500 men). In 1765 the European infantry was divided into 3 regiments, and the whole force was organized in 3 brigades, each consisting of 1 company of artillery, 1 regiment European infantry, 1 troop of native cavalry, and 7 battalions of sepoys. In 1766, on the reduction of some money allowances, a number of officers of the Bengal army agreed to resign their commissions simultaneously. This dangerous combination was promptly put down by Clive, to whom the Bengal army may be said to owe its existence.

The constant wars and extensions of dominion of the next thirty years led to further augmentations; the number of brigades and of European regiments was increased to 6; and in 1794 the Bengal army numbered about 3500 Europeans and 24,000 natives.

71. *Madras.*—The first armed force in the Madras presidency was the little garrison of Armegon on the Coromandel coast, consisting of 28 soldiers. In 1644 Fort St George was built and garrisoned, and in 1653 Madras became a presidency. In 1745 the garrison of Fort St George consisted of 200 Europeans, while a similar number, with the addition of 200 "Topasses" (descendants of the Portuguese), garrisoned Fort St David. In 1748 the various independent companies on the Coromandel coast and other places were consolidated into the Madras European regiment. From this time the military history of the Madras army was full of incident, and it bore the principal part in Clive's victories of Arcot, Kavaripak and Plassey. In 1754 the 39th regiment of the Royal army was sent to Madras. In 1758 three others followed. In 1772 the Madras army numbered 3000 European infantry and 16,000 natives, and in 1784 the number of native troops had risen to 34,000.

72. *Bombay.*—The island of Bombay formed part of the marriage portion received by Charles II. with the infanta of Portugal, and in 1662 the Bombay regiment of Europeans was raised to defend it. In 1668 the island was granted to the Company, and the regiment at the same time transferred to them. In 1708 Bombay became a presidency, but it did not play so important a part as the others in the early extension of British power, and its forces were not so rapidly developed. It is said, however, to have been the first to discipline native troops, and Bombay sepoys were sent to Madras in 1747, and took part in the battle of Plassey in 1757. In 1772 the Bombay army consisted of 2500 Europeans and 3500 sepoys, but in 1794, in consequence of the struggles with the Mahratta power, the native troops had been increased to 24,000.

73. *Consolidation of the Army.*—In 1796 a general reorganization took place. Hitherto the officers in each presidency had been borne on general "lists," according to branches of the service. These lists were now broken up and cadres of regiments formed. The colonels and lieutenant-colonels remained on separate lists, and an establishment of general officers was created, while the divisional commands were distributed between the royal and Company's officers. Further augmentations took place, consequent on the great extension of British supremacy. In 1798 the native infantry in India numbered 122 battalions. In 1808 the total force in India amounted to 24,500 Europeans and 154,500 natives.

The first half of the 19th century was filled with wars and annexations and the army was steadily increased. Horse artillery was formed, and the artillery in general greatly augmented. "Irregular cavalry" was raised in Bengal and Bombay, and recruited from a better class of troopers, who received high pay and found their own horses and equipment. "Local forces" were raised in various parts from time to time, the most important being the Punjab irregular force (raised after the annexation of the Punjab in 1849), consisting of 3 field batteries, 5 regiments of cavalry, and 5 of infantry, and the Nagpur and Oudh irregular forces. Another kind of force, which had been gradually formed, was that called "contingents"—troops raised by the protected native states. The strongest of these was that of Hyderabad, originally known as the nizam's army. Changes were also made in the organization of the army. Sanitary improvements were effected, manufacturing establishments instituted or increased, and the administration generally improved.

74. *The Army before the Mutiny.*—The officering and recruiting of the three armies were in all essentials similar. The officers were mainly supplied by the Company's military college at Addiscombe in Surrey (established in 1809), and by direct appointments. The Bengal army was recruited from Hindustan, the infantry being mostly drawn from Oudh and the great Gangetic plains. The soldiers were chiefly high-caste Hindus, a sixth being Mahommedans. The cavalry was composed mainly of Mahommedans, recruited from

Rohilkhand and the Gangetic Doab. The only other elements in the army were four Gurkha regiments, enlisted from Nepal, and the local Punjab irregular force. The Madras army was chiefly recruited from that presidency, or the native states connected with it, and consisted of Mahommedans, Brahmans, and of the Mahratta, Tamil and Telugu peoples. The Bombay army was recruited from its own presidency, with some Hindustanis, but chiefly formed of Mahrattas and Mahommedans; the Bombay light cavalry mainly from Hindustan proper.

Including the local and irregular troops (about 100,000 strong), the total strength amounted to 38,000 Europeans of all arms, with 276 field guns, and 348,000 native troops, with 248 field guns,—truly a magnificent establishment, and, outwardly, worthy of the great empire which England had created for herself in the East, but inwardly unsound, and on the very verge of the great mutiny of 1857.

In 1856 the establishment in the several presidencies was a follows:—

	Bengal.	Madras.	Bombay.	Total.
British Cavalry Regiments	2	1	1	4
British Infantry Battalions	15	3	4	22
Company's European Battalions	3	3	3	9
European and Native Artillery Battalions	12	7	5	24
Native Infantry Battalions	74	52	29	155
Native Cavalry Regiments	28	8	3	39

An account of the events of 1857-58 will be found under INDIAN MUTINY. After the catastrophe the reorganization of the military forces on different lines was of course unavoidable. Fortunately, the armies of Madras and Bombay had been almost wholly untouched by the spirit of disaffection, and in the darkest days the Sikhs, though formerly enemies of the British, had not only remained faithful to them, but had rendered them powerful assistance.

75. *The Reorganization.*—By the autumn of 1858 the mutiny was virtually crushed, and the task of reorganization commenced. On the 1st of September 1858 the East India Company ceased to rule, and Her Majesty's government took up the reins of power. On the important question of the army, the opinions and advice of the most distinguished soldiers and civilians were invited. Masses of reports and evidence were collected in India, and by a royal commission in England. On the report of this commission the new system was based. The local European army was abolished, and its personnel amalgamated with the royal army. The artillery became wholly British, with the exception of a few native mountain batteries. The total strength of the British troops, all of the royal army, was largely increased, while that of the native troops was largely diminished. Three distinct native armies—those of Bengal, Madras and Bombay—were still maintained. The reduced Indian armies consisted of cavalry and infantry only, with a very few artillery, distributed as follows:—

	Battalions Infantry.	Regiments Cavalry.
Bengal	49	19
Madras	40	4
Bombay	30	7
Punjab Force	12	6
	—	—

Total	131	36

There were also three sapper battalions, one to each army.

The Punjab force, which had 5 batteries of native artillery attached to it, continued under the Punjab government. In addition, the Hyderabad contingent of 4 cavalry, 6 infantry regiments and 4 batteries, and a local force in central India of 2 regiments cavalry and 6 infantry, were retained under the government of India. After all the arrangements had been completed the army of India consisted of 62,000 British and 125,000 native troops.

76. *The Modern Army.*—The college at Addiscombe was closed in 1860, and the direct appointment of British officers to the Indian local forces ceased in 1861. In that year a staff corps was formed by royal warrant in each presidency "to supply a body of officers for service in India, by whom various offices and appointments hitherto held by officers borne on the strength of the several corps in the Indian forces shall in future be held." Special roles were laid down. The corps was at first recruited partly from officers of the Company's service and partly from the royal army, holding staff appointments (the new regimental employment being considered as staff duty) and all kinds of political and civil posts; for the system established later see INDIA: *Army*. The native artillery and sappers and miners were to be officered from the Royal Artillery and Royal Engineers. The only English warrant and non-commissioned officers now to be employed in the native army were to be those of the Royal Engineers with the sappers and miners.

A radical change in the regimental organization of all the native armies was effected in 1863. The Punjab Frontier Force was from the first organized on the irregular system, which was there seen at its best, as also were the new regiments raised during the Mutiny. This system was now applied to the whole army, each regiment and battalion having seven British officers attached to it for command and administrative duties, the immediate command of troops and companies being left to the native officers. Thus was the system reverted to, which was initiated by Clive, of a few British officers only being attached to each corps for the higher regimental duties of command and control. Time had shown that this was more effective than the regular system instituted in 1796 of British officers commanding troops and companies.

A new spirit was breathed into the army. The supremacy of the commandant was the main principle. He was less hampered by the unbending regulations enjoined upon the old regular regiments, had greater powers of reward and punishment, was in a position to assume larger responsibility and greater freedom of action, and was supported in the full exercise of his authority. The system made the officers.

Up to 1881 the native army underwent little change, but in that year 18 regiments of infantry and 4 of cavalry were broken up, almost the same total number of men being maintained in fewer and stronger regiments. The only reduction made in the British troops was in the Royal Artillery, which was diminished by 11 batteries. The events of 1885, however, on the Russo-Afghan frontier, led to augmentations. The 11 batteries Royal Artillery were brought back from England; each of the 9 British cavalry regiments in India received a fourth squadron; each of the British infantry battalions was increased by 100 men, and 3 battalions were added. The native cavalry had a fourth squadron added to each regiment; three of the four regiments broken up in 1881 were re-raised, while the native infantry was increased in regimental strength, and 9 new battalions raised composed of Gurkhas, Sikhs and Punjabis. The addition in all amounted to 10,600 British and 21,200 native troops. In 1890 the strength of the army of India was 73,000 British and, including irregulars, 147,500 native troops. For the Indian volunteers, see VOLUNTEERS.

Many important changes took place between 1885 and 1904. Seven Madras infantry regiments were converted into regiments for service in Burma, composed of Gurkhas and hardy races from northern India;

six Bengal and Bombay regiments were similarly converted into regiments of Punjabis, Pathans and Gurkhas; the native mountain batteries have been increased to ten; a system of linked battalions has been introduced with the formation of regimental centres for mobilization; and reserves for infantry and mountain artillery have been formed. The number of British officers with each regiment has been increased to nine, and the two wing commands in battalions have been converted into 4 double-company commands of 250 men each, under a British commander, who is responsible to the commandant for their training and efficiency, the command of the companies being left to the native officers. This system, which is analogous to the squadron command in the cavalry, admits of closer individual attention to training, and distributes among the senior British regimental officers effective responsibility of a personal kind.

An addition (at the imperial expense) of five battalions of Sikhs, Punjabi Mahommedans, Jats and hillmen in northern India was made in 1900, as the result of India being called upon to furnish garrisons for Mauritius and other stations overseas.

The unification of the triplicate army departments in the different presidential armies was completed in 1891, all being brought directly under the supreme government; and the three separate staff corps of Bengal, Madras and Bombay were fused into one in 1891 as the Indian Staff Corps. The term “Indian Staff Corps” was in turn replaced by that of “Indian Army” in 1903. These measures prepared the way for the new system of army organization which, by authority of parliament, abolished divided control and placed the whole army of India under the governor-general and the commander-in-chief in India.

Canadian Forces

77. In the earliest European settlements in Canada, the necessity of protection against Indians caused the formation of a militia, and in 1665 companies were raised in every parish. The military history of the Canadian forces under French rule is full of incident, and they served not only against Indian raiders but also against the troops of Great Britain and of her North American colonies. Six militia battalions took part in the defence of Quebec in 1759, and even the transfer of Canada from the French to the British crown did not cause the disbandment of the existing forces. The French Canadians distinguished themselves not less than the British settlers in the War of American Independence, and in particular in the defence of Quebec against Montgomery and Arnold. In 1787 an ordinance was made whereby three battalions of the militia were permanently embodied, each contingent serving for two years, at the end of which time a fresh contingent relieved it, and after this a succession of laws and regulations were made with a view to complete organization of the force. The brunt of the fighting on the American frontier in the war of 1812 was borne very largely by the permanent force of three battalions and the fresh units called out, all these being militia corps. Up to 1828 a distinction had been made between the British and the French regiments: this was then abolished. The militia was again employed on active service during the disturbances of 1837, and the “Active Militia” in 1863 had grown to a strength of 25,000 men. The Fenian troubles of 1864 and 1866 caused the embodiment of the Canadian forces once more. In 1867 took place the unification of Canada, after which the whole force was completely organized on the basis of a militia act (1868). A department of Militia and Defence with a responsible minister was established, and the strength of the active militia of all arms was fixed at 40,000 rank and file. Two years later the militia furnished 6000 men to deal with the Fenian Raid of 1870, and took part in Colonel (Lord) Wolseley’s Red River expedition. In 1871 a permanent force, serving the double purpose of a regular nucleus and an instructional cadre, was organized in two troops of cavalry, two batteries of artillery and one regiment of infantry, and in 1876 the Royal Military College of Canada was founded at Kingston. In 1885 the Riel rebellion was dealt with, and

the important action of Batoche won, by the militia, without assistance from regular troops. In the same year Canada contributed a force of *voyageurs* to the Nile expedition of Lord Wolseley; the experience of these men was admittedly of great assistance in navigating the Rapids. The militia sent contingents of all arms to serve in the South African War, 1899-1902, including "Strathcona's Horse," a special corps, recruited almost entirely from the Active Militia and the North-west Mounted Police. The latter, a permanent constabulary of mounted riflemen, was formed in 1873.

After the South African War an extensive scheme of reorganization was taken in hand, the command being exercised for two years (1902-1904) by Major-General Lord Dundonald, and subsequently by a militia council (Militia Act 1904), similar in constitution to the home Army Council. For details of the present military strength of Canada, see the article CANADA.

AUSTRIAN ARMY

78. The *Landsknecht* infantry constituted the mainstay of the imperial armies in the 16th century. Maximilian I. and Charles V. are recorded to have marched and carried the "long pike" in their ranks. Maximilian also formed a corps of *Kyrisser*, who were the origin of the modern cuirassiers. It was not, however, until much later that the Austrian army came into existence as a permanent force. Rudolph II. formed a small standing force about 1600, but relied upon the "enlistment" system, like other sovereigns of the time, for the bulk of his armies. The Thirty Years' War produced the permanence of service which led in all the states of Europe to the rise of standing armies. In the Empire it was Wallenstein who first raised a distinctly imperial army of soldiers owing no duty but to the sovereign; and it was the suspicion that he intended to use this army, which was raised largely at his own expense, to further his own ends, that led to his assassination. From that time the regiments belonged no longer to their colonels, but to the emperor; and the oldest regiments in the present Austrian army date from the Thirty Years' War, at the close of which Austria had 19 infantry, 6 cuirassier and 1 dragoon regiments. The almost continuous wars of Austria against France and the Turks (from 1495 to 1895 Austrian troops took part in 7000 actions of all sorts) led to a continuous increase in her establishments. The wars of the time of Montecucculi and of Eugene were followed by that of the Polish Succession, the two Turkish wars, and the three great struggles against Frederick the Great. Thus in 1763 the army had been almost continuously on active service for more than 100 years, in the course of which its organization had been modified in accordance with the lessons of each war. This, in conjunction with the fact that Austria took part in other Turkish campaigns subsequently, rendered this army the most formidable opponent of the forces of the French Revolution (1792). But the superior leading, organization and numbers of the emperor's forces were totally inadequate to the magnitude of the task of suppressing the Revolutionary forces, and though such victories as Neerwinden were sufficient proof of the efficiency and valour of the Austrians, they made no headway. In later campaigns, in which the enemy had acquired war experience, and the best of their officers had come to the front, the tide turned against the Imperialists even on the field of battle. The archduke Charles's victories of 1796 were more than counterbalanced by Bonaparte's Italian campaign, and the temporary success of 1799 ended at Marengo and Hohenlinden.

79. The Austrians, during the short peace which preceded the war of 1805, suffered, in consequence of all this, from a feeling of distrust, not merely in their leaders, but also in the whole system upon which the army was raised, organized and trained. This was substantially the same as that of the Seven Years' War time. Enlistment being voluntary and for long service, the numbers necessary to cope with the output of the French conscription could not be raised, and the inner history of the Austrian headquarters in the Ulm campaign shows that the dissensions and mutual distrust of the general officers had gone far towards the disintegration of an army which at that time had the most *esprit de corps* and the highest military qualities of any army in Europe. But the disasters of

1805 swept away good and bad alike in the abolition of the old system. Already the archduke Charles had designed a "nation in arms" after the French model, and on this basis the reconstruction was begun. The conscription was put in force and the necessary numbers thus obtained; the administration was at the same time reformed and the organization and supply services brought into line with modern requirements. The war of 1809 surprised Austria in the midst of her reorganization, yet the new army fought with the greatest spirit. The invasion of Bavaria was by no means so leisurely as it had been in 1805, and the archduke Charles obtained one signal victory over Napoleon in person. Aspern and Wagram were most desperately contested, and though the archduke ceased to take part in the administration after 1809 the work went on steadily until, in 1813, the Austrian armies worthily represented the combination of discipline with the "nation in arms" principle. Their intervention in the War of Liberation was decisive, and Austria, in spite of her territorial losses of the past years, put into the field well-drilled armies far exceeding in numbers those which had appeared in the wars of the Revolution. After the fall of Napoleon, Austria's hold on Italy necessitated the maintenance of a large army of occupation. This army, and in particular its cavalry, was admittedly the best in Europe, and, having to be ready to march at a few days' notice, it was saved from the deadening influence of undisturbed peace which affected every other service in Europe from 1815 to 1850.

80. The Austrian system has conserved much of the peculiar tone of the army of 1848, of which English readers may obtain a good idea from George Meredith's *Vittoria*. It was, however, a natural result of this that the army lost to some considerable extent the spirit of the "nation in arms" of 1809 and 1813. It was employed in dynastic wars, and the conscription was of course modified by substitution; thus, when the war of 1859 resulted unfavourably to the Austrians, the army began to lose confidence, precisely as had been the case in 1805. Once more, in 1866, an army animated by the purely professional spirit, which was itself weakened by distrust, met a "nation in arms," and in this case a nation well trained in peace and armed with a breechloader. Bad staff work, and tactics which can only be described as those of pique, precipitated the disaster, and in seven weeks the victorious Prussians were almost at the gates of Vienna.

The result of the war, and of the constitutional changes about this time, was the re-adoption of the principles of 1806-1813, the abolition of conscription and long service in favour of universal service for a short term, and a thorough reform in the methods of command and staff work. It has been said of the Prussian army that "discipline is—the officers." This is more true of the "K.K." army[1] than of any other in Europe; the great bond of union between the heterogeneous levies of recruits of many races is the spirit of the corps of officers, which retains the personal and professional characteristics of the old army of Italy.

French Army

81. The French army (see for further details France: *Law and Institutions*) dates from the middle of the 15th century, at which time Charles VII. formed, from mercenaries who had served him in the Hundred Years' War, the *compagnies d'ordonnance*, and thus laid the foundation of a national standing army. But the armies that followed the kings in their wars still consisted mainly of mercenaries, hired for the occasion; and the work of Charles and his successors was completely undone in the confusion of the religious wars. Louvois, who was minister of Louis XIV., was the true creator of the French royal army. The organization of the first standing army is here given in some detail, as it served as a model for all armies for more than a century, and is also followed to some extent in our own times. Before the advent of Louvois, the forces were royal only in name. The army was a fortuitous concourse of regiments of horse and foot, each of which was the property of its colonel. The companies similarly belonged to their captains, and, the state being then in no condition to buy out these vested interests, superior control was almost illusory. Indeed, all the well-known devices for eluding such control, for instance, showing

imaginary men on the pay lists, can be traced to the French army of the 16th century. A further difficulty lay in the existence of the offices called Colonel-General, Marshal-General and Grand Master of Artillery, between whom no common administration was possible. The grand master survived until 1743, but Louvois managed to suppress the other offices, and even to put one of his own subordinates into the office of grand master. Thus was assured direct royal control, exercised through the war minister. Louvois was unable indeed to overthrow the proprietary system, but he made stringent regulations against abuses, and confined it to the colonels (*mestre de camp* in the cavalry) and the captains. Henceforward the colonel was a wealthy noble, with few duties beyond that of spending money freely and of exercising his court influence on behalf of his regiment. The real work of the service was done by the lieutenant-colonels and lieutenants, and the king and the minister recognized this on all occasions. Thus Vauban was given, as a reward for good service, a company in the "Picardie" regiment without purchase. Promotions from the ranks were very rare but not unknown, and all promotions were awarded according to merit except those to captain or colonel. One of the captains in a regiment was styled major, and acted as adjutant. This post was of course filled by selection and not by purchase. The grades of general officers were newly fixed by Louvois—the *brigadier, maréchal de camp*, lieutenant-general and marshal of France. The general principle was to give command, but not promotion, according to merit. The rank and file were recruited by voluntary enlistment for four years' service. The infantry company was maintained in peace at an effective of 60, except in the guards and the numerous foreign corps, in which the company was always at the war strength of 100 to 200 men. This arm was composed, in 1678, of the *Gardes françaises*, the Swiss guards, the old (*vieux* and *petits vieux*) regiments of the line, of which the senior, "Picardie," claimed to be the oldest regiment in Europe, and the regiments raised under the new system. The *régiment du roi*, which was deliberately made the model of all others and was commanded by the celebrated Martinet, was the senior of these latter. The whole infantry arm in 1678 numbered 320,000 field and garrison troops. The cavalry consisted of the *Maison du Roi* (which Louvois converted from a "show" corps to one of the highest discipline and valour), divided into the *Gardes du Corps* and the *Mousquetaires*, the *Gendarmerie* (descended from the old feudal cavalry and the *ordonnance* companies) and the line cavalry, the whole being about 55,000 strong. There were also 10,000 dragoons. In addition to the regular army, the king could call out, in case of need, the ancient *arrière-ban* or levy, as was in fact done in 1674. On that occasion, however, it behaved badly, and it was not again employed. In 1688 Louvois organized a militia raised by ballot. This numbered 25,000 men and proved to be better, at any rate, than the *arrière-ban*. Many infantry regiments of the line were, as has been said, foreign, and in 1678 the foreigners numbered 30,000, the greater part of these being Swiss.

82. The artillery had been an industrial concern rather than an arm of the service. In sieges a sum of money was paid for each piece put in battery, and the grand master was not subordinated to the war office. A nominee of Louvois, as has been said, filled the post at this time, and eventually Louvois formed companies of artillerymen, and finally the regiment of "Fusiliers" which Vauban described as the "finest regiment in the world." The engineer service, as organized by Vauban, was composed of engineers "in ordinary," and of line officers especially employed in war. Louvois further introduced the system of magazines. To ensure the regular working of supply and transport, he instituted direct control by the central executive, and stored great quantities of food in the fortresses, thereby securing for the French armies a precision and certainty in military operations which had hitherto been wanting. The higher administration of the army, under the minister of war, fell into two branches, that of the commissaries and that of the inspecting officers. The duties of the former resembled those of a modern "routine" staff—issue of equipment, checking of returns, &c. The latter exercised functions analogous to those of a general staff, supervising the training and general efficiency of the troops. Louvois also created an excellent hospital service, mobile and stationary, founded the Hôtel des Invalides in Paris for the maintenance of old soldiers, established cadet schools for the training of young officers, and stimulated bravery and good conduct by reviving and creating military orders of merit.

83. The last half of the 17th century is a brilliant period in the annals of the French armies. Thoroughly organized, animated by the presence of the king, and led by such generals as Condé, Turenne, Luxembourg, Catinat and Vendôme, they made head against coalitions which embraced nearly all the powers of Europe, and made France the first military nation of Europe. The reverses of the later part of Louis XIV.'s reign were not of course without result upon the tone of the French army, and the campaigns of Marlborough and Eugene for a time diminished the repute in which the troops of Louis were held by other powers. Nevertheless the War of the Spanish Succession closed with French victories, and generals of the calibre of Villars and Berwick were not to be found in the service of every prince. The war of the Polish Succession in Germany and Italy reflected no discredit upon the French arms; and the German general staff, in its history of the wars of Frederick the Great, states that "in 1740 the French army was still regarded as the first in Europe." Since the death of Louvois very little had changed. The army was still governed as it had been by the great war minister, and something had been done to reduce evils against which even he had been powerless. A royal regiment of artillery had come into existence, and the engineers were justly regarded as the most skilful in Europe. Certain alterations had been made in the organization of both the guard and the line, and the total strength of the French in peace was somewhat less than 200,000. Relatively to the numbers maintained in other states, it was thus as powerful as before. Indeed, only one feature of importance differentiated the French army from its contemporaries—the proportion of officers to men, which was one to eleven. In view of this, the spirit of the army was necessarily that of its officers, and these were by no means the equals of their predecessors of the time of Turenne or Luxembourg. Louvois' principle of employing professional soldiers for command and wealthy men for colonelcies and captaincies was not deliberately adopted, but inevitably grew out of the circumstances of the time. The system answered fairly whilst continual wars gave the professional soldiers opportunities for distinction and advancement. But in a long peace the captains of eighteen and colonels of twenty-three blocked all promotion, and there was no work save that of routine to be done. Under these conditions the best soldiers sought service in other countries, the remainder lived only for pleasure, whilst the titular chiefs of regiments and companies rarely appeared on parade. Madame de Genlis relates how, when young courtiers departed to join their regiments for a few weeks' duty, the ladies of the court decked them with favours, as if proceeding on a distant and perilous expedition.

On the other hand, the fact that the French armies required large drafts of militia to bring up their regular forces to war strength gave them a vitality which was unusual in armies of the time. Even in the time of Louis XIV. the military spirit of the country had arisen at the threat of invasion, and the French armies of 1709 fought far more desperately, as the casualty lists of the allies at Malplaquet showed, than those of 1703 or 1704. In the time of the Revolution the national spirit of the French army formed a rallying-point for the forces of order, whereas Prussia, whose army was completely independent of the people, lost all power of defending herself after a defeat in the field. It is difficult to summarize the conduct of the royal armies in the wars of 1740-63. With a few exceptions the superior leaders proved themselves incompetent, and in three great battles, at least, the troops suffered ignominious defeat (Dettingen 1743, Rossbach 1757, Minden 1759). On the other hand, Marshal Saxe and others of the younger generals were excellent commanders, and Fontenoy was a victory of the first magnitude. The administration, however, was corrupt and inefficient, and the general reputation of the French armies fell so low that Frederick the Great once refused an important command to one of his generals on the ground that his experience had been gained only against French troops.

Under Louis XVI. things improved somewhat; the American War and the successes of Lafayette and Rochambeau revived a more warlike spirit. Instruction was more carefully attended to, and a good system of drill and tactics was elaborated at the camp of St Omer. Attempts were made to reform the administration. Artillery and engineer schools had come into existence, and the intellectual activity of the best officers was remarkable (see Max Jähns, *Gesch. der Kriegswissenschaften*, vol. iii. passim). But the Revolution soon broke over France, and the

history of the royal army was henceforward carried on by that revolutionary army, which, under a new flag, was destined to raise the military fame of France to its greatest height.

84. If Louis was the creator of the royal army, Carnot was so of the revolutionary army. At the outbreak of the Revolution the royal army consisted of 224 infantry battalions, 7 regiments of artillery, and 62 regiments of cavalry, numbering about 173,000 in all, but capable of augmentation on war strength to 210,000. To this might be added about 60,000 militia (see Chuquet, *Première invasion prussienne*).

The first step of the Constituent Assembly was the abrogation of an edict of 1781 whereby men of non-noble birth had been denied commissioned rank (1790). Thus, when many of the officers emigrated along with their fellows of the *noblesse*, trained non-commissioned officers, who would already have been officers save for this edict, were available to fill their places. The general scheme of reform (see CONSCRIPTION) was less satisfactory, but the formation of a National Guard, comprising in theory the whole military population, was a step of the highest importance. At this time the titles of regiments were abandoned in favour of numbers, and the costly and dangerous *Maison du Roi* abolished. But voluntary enlistment soon failed; the old corps, which kept up their discipline, were depleted, and the men went to the volunteers, where work was less exacting and promotion more rapid. *"Aussi fut-on,"* says a French writer, *"réduit bientôt à forcer l'engagement volontaire et à imposer le choix du corps."* The "first invasion" (July 1792) put an end to half-measures, and the country was declared "in danger." Even these measures, however, were purely designed to meet the emergency, and, after Valmy, enthusiasm waned to such a degree that, of a paper strength of 800,000 men (December 1792), only 112,000 of the line and 290,000 volunteers were actually present. The disasters of the following spring once more called for extreme energy, and 300,000 national guards were sent to the line, a step which was followed by a compulsory *levée en masse*; one million men were thus assembled to deal with the manifold dangers of civil and foreign war. France was saved by mere numbers and the driving energy of the Terrorists, not by discipline and organization. The latter was chaotic, and almost every element of success was wanting to the tumultuary levies of the year 1793 save a ferocious energy born of liberty and the guillotine. But under the Terrorist régime the army became the rallying-point of the nation, and when Lazare Carnot (*q.v.*) became minister of war a better organization and discipline began to appear. The amalgamation of the old army and the volunteers, which had been commenced but imperfectly carried out, was effected on a different and more thorough principle. The infantry was organized in demi-brigades of three battalions (usually one of the old army to two of volunteers). A permanent organization in divisions of all arms was introduced, and the ablest officers selected for the commands. Arsenals and manufactories of warlike stores were created, schools of instruction were re-established; the republican forces were transformed from hordes to armies, well disciplined, organized and equipped. Later measures followed the same lines, and the artillery and engineers, which in 1790 were admittedly the best in Europe and which owing to the *roturier* element in their officer cadres had not been disorganized by the emigration, steadily improved. The infantry, and in a less degree the cavalry, became good and trustworthy soldiers, and the glorious campaigns of 1794, 1795 and 1796, which were the direct result of Carnot's administration, bore witness to the potentialities of the essentially modern system. But, great as was the triumph of 1796-97, the exhaustion of years of continuous warfare had made itself felt: the armies were reduced to mere skeletons, and no sufficient means existed of replenishing them, till in 1798 the *conscription* was introduced. From that time the whole male population of France was practically at her ruler's disposal; and Napoleon had full scope for his genius in organizing these masses. His principal improvements were effected in the interval between the peace of Amiens and the war with the third coalition, while threatening the invasion of England. His armies were collected in large camps on the coasts of the Channel, and there received that organization which, with minor variations, they retained during all his campaigns, and which has since been copied by all European nations. The divisions had already given place to the army corps, and Napoleon completed the work of his predecessors. He withdrew the whole of the cavalry and a portion of the artillery from the divisions, and thus formed "corps troops" and cavalry and artillery reserves for the whole army. The grade of marshal of

France was revived at Napoleon's coronation. At the same time, the operation of Jourdan's law, acquiesced in during times of national danger and even during peace, soon found opposition when the conscripts realized that long foreign wars were to be their lot. It was not the actual losses of the field armies, great as these undoubtedly were, which led Napoleon in the full tide of his career to adopt the fatal practice of "anticipating" the conscription, but the steady increase in the number of *réfractaires*, men who refused to come up for service. To hunt these men down, no less than forty thousand picked soldiers were engaged within the borders of France, and the actual French element in the armies of Napoleon grew less and less with every extension of the empire. Thus, in the Grand Army of 1809, about one-third of the corps of all arms were purely German, and in 1812 the army which invaded Russia, 467,000 strong, included 280,000 foreigners. In other words, the million of men produced by the original conscription of 1793 had dwindled to about half that number (counting the various subsidiary armies in Spain, &c.), and one hundred thousand of the best and sturdiest Frenchmen were engaged in a sort of civil war in France itself. The conscription was "anticipated" even in 1806, the conscripts for 1807 being called up before their time. As the later wars of the Empire closed one by one the foreign sources of recruiting, the conscription became more terrible every year, with the result that more *réfractaires* and more trusted soldiers to hunt them down were kept in non-effective employment. Finally the capacity for resistance was exhausted, and the army, from the marshals downward, showed that it had had enough.

85. One of the first acts of the Restoration was to abolish the conscription, but it had again to be resorted to within three years. In 1818 the annual contingent was fixed at 40,000, and the period of service at six years; in 1824 the contingent was increased to 60,000, and in 1832 to 80,000. Of this, however, a part only, according to the requirements of the service, were enrolled; the remainder were sent home on leave or furlough. Up to 1855 certain exemptions were authorized, and substitution or exchange of lots amongst young men who had drawn was permitted, but the individual drawn was obliged either to serve personally or find a substitute. The long series of Algerian wars produced further changes, and in 1855 the law of "dotation" or exemption by payment was passed, and put an end to personal substitution. The state now undertook to provide substitutes for all who paid a fixed sum, and did so by high bounties to volunteers or to soldiers for re-engaging. Although the price of exemption was fixed as high as £92, on an average 23,000 were claimed annually, and in 1859 as many as 42,000 were granted. Thus gradually the conscription became rather subsidiary to voluntary enlistment, and in 1866, out of a total establishment of 400,000, only 120,000 were conscripts. Changes had also taken place in the constitution of the army. On the Restoration its numbers were reduced to 150,000, the old regiments broken up and recast, and a royal guard created in place of the old imperial one. When the revolution of July 1830 had driven Charles X. from his throne, the royal guard, which had made itself peculiarly obnoxious, was dissolved; and during Louis Philippe's reign the army was augmented to about 240,000 with the colours. Under the Provisional Government of 1848 it was further increased, and in 1854, when France allied herself with England against Russia, the army was raised to 500,000 men. The imperial guard was re-created, and every effort made to revive the old Napoleonic traditions in the army. In 1859 Napoleon III. took the field as the champion and ally of Italy, and the victories of Montebello, Magenta and Solferino raised the reputation of the army to the highest pitch, and for a time made France the arbiter of Europe. But the campaign of 1866 suddenly made the world aware that a rival military power had arisen, which was prepared to dispute that supremacy.

Marshal Niel (*q.v.*), the then war minister, saw clearly that the organization which had with difficulty maintained 150,000 men in Italy, was no match for that which had within a month thrown 250,000 into the very heart of Austria, while waging a successful war on the Main against Bavaria and her allies. In 1867, therefore, he brought forward a measure for the reorganization of the army. This was to have been a true "nation in arms" based on universal service, and Niel calculated upon producing a first-line army 800,000 strong—half with the colours, half in reserve—with a separate army of the second line. But many years must elapse before the full effect of this principle of recruiting can be produced, as the army is incomplete in some degree until the oldest reservist is a man

who has been through the line training. Niel himself died within a year, and 1870 witnessed the complete ruin of the French army. The law of 1868 remained therefore no more than an expression of principle.

86. At the outbreak of the Franco-German War (*q.v.*) the French field troops consisted of 368 battalions, 252 squadrons, and 984 guns. The strength of the entire army on peace footing was 393,000 men; on war footing, 567,000. Disasters followed one another in rapid succession, and the bulk of this war-trained long-service army was captive in Germany within three months of the opening battle. But the spirit of the nation rose to the occasion as it had done in 1793. The next year's contingent of recruits was called out and hastily trained. Fourth battalions were formed from the depot cadres, and organized into *régiments de marche*. The *gardes mobiles* (Niel's creation) were mobilized, and by successive decrees and under various names nearly all the manhood of the country called to arms.

The regular troops raised as *régiments de marche*, &c., amounted to 213,000 infantry, 12,000 cavalry and 10,000 artillery. The *garde mobile* exceeded 300,000, and the mobilized national guard exceeded 1,100,000—of whom about 180,000 were actually in the field and 250,000 in Paris; the remainder preparing themselves in camps or depots for active work. Altogether the new formations amounted to nearly 1,700,000. Though, in the face of the now war-experienced well-led and disciplined Germans, their efforts failed, this cannot detract from the admiration which must be felt by every soldier for the patriotism of the people and the creative energy of their leaders, of whom Gambetta and Freycinet were the chief. After the war every Frenchman set himself to solve the army problem not less seriously than had every Prussian after Jena, and the reformed French army (see FRANCE) was the product of the period of national reconstruction. The adoption of the "universal service" principle of active army, reserves and second-line troops, the essential feature of which is the *line* training of every man, was almost as a matter of course the basis of the reorganization, for the want of a trained reserve was the most obvious cause of the disasters of "the terrible year."

GERMAN ARMY

87. The German army, strictly speaking, dates only from 1871, or at earliest 1866. Before the unification of the German empire or confederation, the several states possessed distinct armies, federal armies when required being formed from the contingents which the members of the union, like those of an ordinary alliance, engaged to furnish. The armies of the Holy Roman Empire were similarly formed from "single," "double," or "treble" contingents under the supreme command of specially appointed field marshals of the Empire. In the troubles of 1848 there was witnessed the curious spectacle of half of a victorious army being unable to pursue the enemy; this, being composed of "Prussian" as distinct from "federal contingent" troops, had to stop at the frontier of another state. The events of 1866 and 1870 put an end to all this, and to a very great extent to the separate armies of the old confederation, all being now remodelled on Prussian lines. The Prussian army therefore is at once the most important and historically the most interesting of the forces of the German empire. Its *début* (about 1630) was not satisfactory, and in the Thirty Years' War troops of Sweden, of the Emperor, of the League, &c., plundered Brandenburg unharmed. The elector, when appealed to for protection, could but answer, "Que faire? Ils ont des canons." The humiliations of this time, were, however, avenged by the troops of the next ruler of Brandenburg, called the Great Elector. The supposed invincibility of the Swedes did not prevent him from inflicting upon them a severe defeat at Fehrbellin, and thereafter the Prussian contingents which took part in the many European wars of the time acquitted themselves creditably. One of their generals was the famous Leopold of Anhalt-Dessau, and the reckless gallantry of this leader was conspicuous on many fields, from Blenheim to Malplaquet. But Leopold's greatest work was done in the years of peace (1715-40), during which Prussia was preparing the army with which Frederick the Great won his battles. He had introduced (about 1700) iron ramrods into the infantry service, and for

over twenty years the Prussian infantry was drilled to a perfection which gave it a superiority of five to three over the best-drilled troops of the Austrian service, and still greater predominance over the French, which was then accounted the best in Europe. Frederick William I., king of Prussia, directed and supervised the creation of the new Prussian army, and Leopold was his principal assistant. In organization and methods of recruiting, as well as in tactical efficiency, the army of 1740 was equally pre-eminent. Then came the wars of Frederick the Great. It is not too much to say that the infantry won his earlier battles; the cavalry had been neglected both by Frederick William and by Leopold, and Frederick wrote that "it was not worth the devil's while to fetch it away." But the predominance of the infantry was so far indisputable that Frederick was able to devote himself to the reorganization of the mounted arm, with results which appeared in the splendid victories of Hohenfriedberg, Rossbach, Leuthen and Zorndorf. But long before the close of the Seven Years' War the incomparable infantry of the old army had disappeared, to be replaced by foreigners, deserters and vagabonds of all kinds, not to mention the unwilling Saxon and other recruits forced into the king's service. The army of 200,000 men which Frederick bequeathed to his successor was indeed superb, and deserved to be the model of Europe. But with Frederick's death the genius which had animated it, and which alone gave value to such heterogeneous materials, was gone. The long peace had the customary effect of sapping the efficiency of the long-service troops. They still retained their imposing appearance and precision of movement, and overweening self-confidence. But in 1806, after two crushing defeats and a series of humiliating surrenders, Prussia found herself at the feet of the conqueror, shorn of half her territory, obliged to receive French troops in all her towns and fortresses, and only existing on sufferance. But in these very disasters were laid the seeds of her future greatness. By the treaty of Tilsit the Prussian army was limited to 43,000 men. This limitation suggested to Scharnhorst "universal service" on the *Krümper*[2] system already described (see § 36 above).

88. The bitter humiliation and suffering endured under the French yoke aroused a national spirit which was capable of any sacrifices. The civilian became eager to be trained to fight against the oppressor of his country; and when Prussia rose in 1813, the armies she poured into the field were no longer professional, but national armies, imperfectly trained and organized, but animated by a spirit which more than compensated for these defects. At the close of the war her rulers, with far-seeing sagacity, at once devoted themselves to organize on a permanent footing the system which had sprung up under the necessities and enthusiasm of the moment. Universal compulsory service, and a three years' term in the ranks, with further periods in the reserve and *Landwehr*, were then introduced; and though variations have subsequently been made in the distribution of time, the principles were substantially the same as those now in force. By the law of 1814 the periods of service were fixed at three years in the army, two in the reserve and fourteen in the *Landwehr*, and the annual contingent at 40,000 men. As the population increased, it was felt that the service was unequally distributed, pressing unnecessarily heavily on some, while others escaped altogether. Further, the experiences of Bronnzell and Olmütz in 1850, and of 1859, when Prussia armed in anticipation of a war with France, aroused great doubts as to the efficiency of the *Landwehr*, which then formed the bulk of Prussia's forces, and of whom many had been as long as ten years away from the colours. At this time the French remark that the Prussian army was "a sort of militia" was by no means untrue. Accordingly, by the law of 1860 the annual contingent was fixed at 63,000, the period in the reserve was increased from two to four years, and that in the *Landwehr* reduced from fourteen to five. The total armed force thus remained nearly the same (12 contingents of 63,000, in place of 19 of 40,000), but the army and its reserves were more than doubled (increased from 5 × 40,000 to 7 × 63,000) while the *Landwehr* was proportionately reduced.

This change was not effected without great opposition, and led to a prolonged struggle between the king, guided by Bismarck, and the parliament. It required the victories of 1866 and 1870, and the position thereby won for Prussia, to reconcile the nation to the new law. The military alliance (1866) of Prussia with the other German states gave place in 1871 to the union of all the armies into the German army as it is to-day. Some retained their old

peculiarities of uniform, and even more than this was allowed to Bavaria and to Saxony, but the whole army, which has been increased year by year to its present strength, is modelled on the Prussian part of it. The Prussian army corps are the Guard, and the line numbered I. to XI., and XV. to XVIII.

89. The *Saxon Army* formerly played a prominent part in all the wars of northern Europe, chiefly in connexion with Poland. In the War of the Austrian Succession the Saxon army played a prominent part, but in the end it suffered a heavy defeat in the battle of Kesselsdorf (1745). In the Seven Years' War Saxony was overrun by the Prussians almost without resistance, and the military forces of the country under Field Marshal Rutowski were forced to surrender *en masse* at Pirna (1756); the men were compelled by Frederick the Great to join the Prussian army, and fought, though most unwillingly, through the remainder of the war as Prussian soldiers. A few outlying regiments which had not been involved in the catastrophe served with the Austrians, and on one occasion at least, at Kolin, inflicted a severe blow on the Prussians. At the outbreak of the wars of the French Revolution the Saxon army was over 30,000 strong. It took part in the campaign of Jena on the side of the Prussians, and during the Napoleonic domination in Germany Saxony furnished strong contingents to the armies of Napoleon, who in return recognized her elector as king, and largely increased his territories. The newly made king remained faithful to Napoleon even in his reverses; but the army was too German in feeling to fight willingly under the French flag. Their defection at Leipzig contributed not a little to the results of that bloody day. After the peace the king was shorn of a great part of his dominions, and the army was reconstituted on a smaller scale. In 1866 Saxony sided with Austria, and her army shared in the disasters of the brief campaign and the crowning defeat at Königgrätz. Under the crown prince's leadership, however, the Saxons distinguished themselves by their courage and steadiness wherever they were engaged. After the war Saxony became part of the North German Confederation, and in 1870-1871 her troops, under the command of the crown prince, formed the XII. corps of the great German army. They were assigned to the II. army of Prince Frederick Charles, and delivered the decisive attack on the French right at Gravelotte. Subsequently a IV. army was formed under the command of the crown prince, in which the XII. corps, now under Prince George of Saxony, served with unvarying credit in the campaign of Sedan and the siege of Paris. The Saxon army is now organized in every respect on Prussian lines, and forms two army corps (XII. at Dresden and XIX. at Leipzig) of the German army. The German emperor, in concert with the king of Saxony, names the officers for the higher commands. Saxony retains, however, her separate war ministry, budget, &c.; and appointments and promotion to all but the highest commands are made by the king. The colours of the older Saxon forces, and especially the green of the tunics, are retained in many of the uniforms of the present day.

90. The *Bavarian Army* has perhaps the most continuous record of good service in the field of any of the minor German armies. The oldest regiments date from the Thirty Years' War, in which the veteran army of the Catholic league, commanded by Count Tilly and formed on the nucleus of the Bavarian army, played a conspicuous part. Later in the war the Bavarian general, Count Mercy, proved himself a worthy opponent of Turenne and Condé. Henceforward the Bavarians were engaged in almost every war between France and Austria, taking part successively in the wars of the Grand Alliance, the Spanish Succession (in which they came into conflict with the English), and the Polish and Austrian Succession wars. In pursuance of the traditional anti-Austrian policy, the troops of Bavaria, led by a distinguished Bavarian, Marshal (Prince) Wrede, served in the campaigns of 1805 to 1813 side by side with the French, and Napoleon made the electorate into a kingdom. But in 1813 Bavaria joined the Alliance, and Wrede tried to intercept the French on their retreat from Leipzig. Napoleon, however, inflicted a severe defeat on his old general at Hanau, and opened his road to France. In 1866 the Bavarians took part against Prussia, but owing to their dilatoriness in taking the field, the Prussians were able to beat them in detail. In 1870, reorganized to some extent on Prussian lines, they joined their former enemy in the war against France, and bore their full share in the glories and losses of the campaign, the II. Bavarian corps having suffered more heavily than any but the III. Prussian corps. The I. Bavarian corps distinguished itself very greatly at Sedan and on the Loire. Bavaria still retains her separate war office and special organization, and the troops have been less affected by the Prussian influence than those of the other states. The Bavarian corps are numbered separately (I. Bav., Münich; II. Bav., Würzburg; III. Bav., Nuremberg), and the old light blue uniforms and other distinctive peculiarities of detail are still maintained.

91. *Württemberg* furnishes one army corps (XIII.; headquarters, Stuttgart), organized, clothed and equipped in all respects like the Prussian army. Like the Bavarians, the Württembergers fought against the Prussians in 1866, but in 1870 made common cause with them against the French, and by the convention entered into the following year placed their army permanently under the command of the Prussian king as emperor. The emperor nominates to the highest commands, but the king of Württemberg retains the nomination and appointment of officers in the lower grades.

92. The old *Hanoverian Army* disappeared, of course, with the annexation of Hanover to Prussia in 1866, but it is still represented officially by certain regiments of the X. army corps, and, in one case at least, battle honours won by the King's German Legion in the British service are borne on German colours of to-day. The *Hessian Army* is now represented by the XXV. (Grand-ducal Hessian) division, which forms part of the XVIII. army corps.

Italian Army

93. The old conscription law of the kingdom of Sardinia is the basis of the military organization of Italy, as its constitution is of that of the modern Italian kingdom. The Piedmontese have long borne a high reputation for their military qualities, a reputation shared by the rulers of the house of Savoy (*q.v.*), many of whom showed special ability in preserving the independence of their small kingdom between two such powerful neighbours as France and Austria. During the wars of the French Revolution Piedmont was temporarily absorbed into the French republic and empire. The Italian troops who fought under Napoleon proved themselves, in many if not most cases, the best of the French allies, and

Italy contributed large numbers of excellent general officers to the *Grande Armée*.

After 1815 various causes combined to place Piedmont (Sardinia) at the head of the national movement which agitated Italy during the ensuing thirty years, and bring her in direct antagonism to Austria. Charles Albert, her then ruler, had paid great attention to the army, and when Italy rose against Austria in 1848 he took the field with an excellent force of nearly 70,000 men. At the outset fortune favoured the arms of Italy; but the genius and energy of Radetzky, the veteran Austrian commander, turned the tide, and in the summer of 1849 after many battles the Piedmontese army was decisively defeated at Novara, and her king compelled to sue for peace. Charles Albert abdicated in favour of his son Victor Emanuel, a prince who had already distinguished himself by his personal gallantry in the field. Under his care the army soon recovered its efficiency, and the force which joined the allied armies in the Crimea attracted general admiration from the excellence of its organization, equipment and discipline. In 1859 Piedmont again took up arms against Austria for the liberation of Italy; but this time she had the powerful assistance of France, and played but a subordinate part herself. In this campaign the Sardinian army was composed of one cavalry and five infantry divisions, and numbered about 60,000 combatants. By the peace of Villafranca, Italy, with the exception of Venetia, was freed from the Austrians, and Lombardy was added to Piedmont. The revolutionary campaign of Garibaldi in the following year united the whole peninsula under the rule of Victor Emanuel, and in 1866, when Italy for the third time took up arms against Austria—this time as the ally of Prussia—her forces had risen to nearly 450,000, of whom about 270,000 actually took the field. But in quality these were far from being equal to the old Piedmontese

army; and the northern army, under the personal command of the king, was decisively defeated at Custozza by the archduke Albert of Austria.

The existing organization of the Italian army is determined by the laws of 1873, which made universal liability to service the basis of recruiting. The territorial system has not, however, been adopted at the same time, the materials of which the Italian army is composed varying so much that it was decided to blend the different types of soldiers so far as possible by causing them to serve together. The colonial wars in which Italian troops have taken part have been marked with great disasters, but relieved by the gallantry of the officers and the rank and file.

Russian Army

94. The history of the Russian army begins with the abolition of the Strelitz (*q.v.*) by Peter the Great in 1698, the nucleus of the new forces being four regiments of foot, two of which are well known to-day under their old titles of Preobrazhenski and Semenovski. Throughout the 18th century Russian military progress obeyed successive dynasties of western European models—first those of Prussia, then those of France. In the earlier part of the 19th century the army, used chiefly in wars against the revolutionary spirit, became, like others of that time, a dynastic force; subsequently the "nation in arms" principle reasserted itself, and on this basis has been carried out the reorganization of Russia's military power. The enormous development of this since 1874 is one of the most striking phenomena in recent military history. In 1892, in expectation of a general European war, whole armies were massed in the districts of Warsaw and Vilna, three-fifths of the entire forces being in position on the German and Austrian frontiers.

The Russo-Japanese War of 1904-5 is generally held to have proved that the fighting power of the Russian has in no way diminished in intrinsic value from that of the days of Zorndorf, Borodino and Sevastopol. The proverbial stubbornness of the rank and file is the distinctive quality of the armies of the tsar, and in view of the general adoption of two-years' service in other countries it is a matter for grave consideration whether, against European forces and in defence of their own homes, the Russians would not prove more than formidable antagonists to the men of more highly individualized races who are their probable opponents. Equally remarkable is the new power of redistribution possessed by Russia. Formerly it was usual to count upon one campaign at least elapsing before Russia could intervene effectively in European wars; much, in fact the greater part, of her losses in the Crimean War was due to the enormous distances which had to be traversed on foot. Nowadays the original equal distribution of the army over the country has been modified in accordance with the political needs of each moment. In 1892 the centre of gravity was shifted to Poland and Kiev, in 1904 the performances of the trans-Siberian railway in transporting troops to the seat of war in Manchuria excited the admiration of military Europe. The attitude of the army in the troubles which followed upon the Japanese War belongs to the history of Russia, not to that of military organization, and it will be sufficient to say that the conduct of the "nation in arms" at times of political unrest may vary between the extremes of unquestioning obedience to authority and the most dangerous form of licence, examples of both being frequent in the history of nearly all national armies. A remarkable innovation in the modern history of this army is the conversion of the whole of the cavalry, except a few *élite* regiments, into dragoons of the old type. After the war of 1904-5, however, this policy was reversed and the cavalry reformed on the

usual model. The Cossacks still retain to a large extent the peculiarities of the light troops of the 18th century.

Spanish Army

95. The feudal sovereignties of medieval Spain differed but little, in their military organization, from other feudal states. As usual, mercenaries were the only forces on which reliance was placed for foreign wars. These troops called *almugávares* (Arabic=scouts) won a great reputation on Italian and Greek battlefields of the 13th century, and with many transformations in name and character appeared from time to time up to the Peninsular War. Castile, however, had a military system very different from the rest. The forces of the kingdom were composed of local contingents similar to the English *fyrd*, professional soldiers who were paid followers of the great lords, and the heavy cavalry of the military orders. The groups of cities called *Hermandades*, while they existed, also had permanent forces in their pay. At the union of Castile and Aragon the Castilian methods received a more general application. The new *Hermandad* was partly a light cavalry, partly a police, and was organized in the ratio of one soldier to every hundred families. In the conquest of Grenada (1482-92) *mesnadas* or contingents were furnished by the crown, the nobles and the cities, and permanently kept in the field. The *Hermandad* served throughout the war as a matter of course. From the veterans of this war was drawn the army which in the Italian wars won its reputation as the first army in Europe.

In 1596 the home defence of Spain was reorganized and the *ordenanza*, or militia, which was then formed of all men not belonging to the still extant feudal contingents, was generally analogous to the system of “assizes at arms” in England. This *ordenanza* served in the Peninsular War.

96. With the Italian wars of the early 16th century came the development of the regular army; a brief account of its place in the evolution of armies has been given above. Discipline, the feeling of comradeship and soldierly honour were the qualities which marked out the Spanish army as the model for others to follow, and for more than a century the Spanish army maintained its prestige as the first in Europe. The oldest regiments of the present Spanish army claiming descent from the *tercios* date from 1535. An officer whose regiment was reduced commonly took a pike in some other corps (*e.g.* Tilly), the *señor soldado* was counted as a gentleman, and his wife and family received state allowances. Nor was this army open only to Spaniards. Walloons, Italians, Burgundians and other nationalities ruled over by the Habsburgs all contributed their quotas. But the career of the old army came to an end at Rocroi (1643), and after this the forces of the monarchy began more and more to conform to the French model.

97. The military history of Spain from 1650 to 1700 is full of incident, and in the long war of the Spanish Succession both the army and the *ordenanza* found almost continuous employment. They were now organized, as were most other armies of Europe, on the lines of the French army, and in 1714 the old *tercios*, which had served in the Spanish Netherlands under Marlborough, were brought to Spain. The king's regiment "Zamora" of the present army descends from one of these which, as the *tercio* of Bovadilla, had been raised in 1580. The army underwent few changes of importance during the 18th century, and it is interesting to note that there were never less than three Irish regiments in the service. In 1808 the *Irlanda, Ultonia* (= Ulster) and *Hibernia* regiments had come to consist (as had similar corps in the French service before the Revolution) largely of native soldiers. At that time the Spanish army consisted of 119 Spanish and foreign (Swiss, Walloon and Irish) battalions, with 24 cavalry regiments and about

8000 artillery and engineers. There were further 51 battalions of militia, and the total forces numbered actually 137,000. The part played by the Spanish standing army in the Peninsular War was certainly wholly insignificant relatively to these figures. It must be borne in mind, however, that only continued wars can give real value to long-service troops of the old style, and this advantage the Spanish regulars did not possess. Further, the general decadence of administration reacted in the usual way, the appointment of court favourites to high command was a flagrant evil, and all that can be urged is that the best elements of the army behaved as well as did the Prussians of 1806, that the higher leading and the administration of the army in the field were both sufficiently weak to have ruined most armies, and that the men were drawn from the same country and the same classes which furnished the *guerrilleros* whom it became fashionable to exalt at the expense of the soldiers. In the later campaigns of Wellington, Spanish divisions did good service, and the corps of La Romaña (a picked contingent of troops which had been sent before the war to Denmark at Napoleon's instance), though often defeated, always retained some cohesion and discipline. But the result of this war, the second French invasion, and the continued civil wars of the 19th century was the destruction of the old army, and the present army of Spain still bears traces of the confusion out of which it arose.

The most important changes were in 1870, when conscription was introduced, and in 1872, when universal service was proposed in its place. The military virtues of the rank and file and the devotion of the officers were conspicuously displayed in the Spanish-American War of 1898, and it cannot be claimed even for the Germans of 1870 that they fired so coolly and accurately as did the defenders of S. Juan and El Caney.

Turkish Army

98. The writers who have left the most complete and trustworthy contemporary accounts of the Turkish army in the 14th and 15th centuries, when it reached the height of its most characteristic development, are Bertrandon de la Brocquière, equerry to Philip the Good, duke of Burgundy, and Francesco Filelfo of Tolentino. Bertrandon, a professional soldier, visited Palestine in 1432, and returned overland in 1433, traversing the Balkan Peninsula by the main trade-route from Constantinople to Belgrade. He wrote an account of his journey for Philip: see *Early Travels in Palestine*, translated and edited by T. Wright (London, 1848). Filelfo served as secretary to the Venetian *baylo* at Constantinople, and recorded his observations in a series of letters (see Filelfo). Both ascribe the military superiority of the Turks over the nations of western Europe to two facts—firstly to their possession of a well-organized standing army, an institution unknown elsewhere, and secondly to their far stricter discipline, itself a result of their military organization and of the moral training afforded by Islam.

The regular troops comprised the Janissaries (*q.v.*), a corps of infantry recruited from captured sons of Christians, and trained to form a privileged caste of scientific soldiers and religious fanatics; and the Spahis, a body of cavalry similarly recruited, and armed with scimitar, mace and bow. Celibacy was one of the rules of this standing army, which, in its semi-monastic ideals and constitution, resembled the knightly orders of the West in their prime. The Janissaries numbered about 12,000, the Spahis about 8000. A second army of some 40,000 men, mostly mounted and armed like the Spahis, was feudal in character, and consisted chiefly of the personal followers of the Moslem nobility; more than half its numbers were recruited in Europe.

This force of 60,000 trained soldiers was accompanied by a horde of irregulars, levied chiefly among the barbarous mountaineers of the Balkans and Asia Minor, and very ill-armed and ill-disciplined. Their numbers may be estimated at 140,000, for Bertrandon gives 200,000 as the total of the Turkish forces. Many 15th and 16th century writers give a smaller total, but refer only to the standing and feudal armies. Others place the total higher. Laonicus Chalcocondylas in his *Turcica Historia* states that at the siege of Constantinople in 1453 the sultan commanded 400,000 troops, but most other eye-witnesses of the siege give a total varying from 150,000 to 300,000. Many Christian soldiers of fortune enlisted with the Turks as artillerists or engineers, and supplied them at Constantinople with the most powerful cannon of the age. Other Christians were compelled to serve as engineers or in the ranks. As late as 1683 a corps of Wallachians was forced to join the Turkish army before Vienna, and entrusted with the task of bridging the Danube. But in the 18th and early 19th centuries the introduction of Christians tended to weaken the *moral* of the army already sapped by defeat; it was found impossible to maintain the discipline of the Janissaries, whose privileges had become a source of danger; and the feudal nobility became more and more independent of the sultan's authority. These three causes contributed to make reorganization inevitable.

The destruction of the Janissaries in 1826 marked the close of the history of the old Turkish army; already the re-creation of the service on the accepted models of western Europe had been commenced. This was still incomplete when the new force was called upon to meet the Russians in 1828, and though the army displayed its accustomed bravery, its defective organization and other causes led to its defeat. Since then the army has been almost as constantly on active service as the British; the Crimean War, the Russo-Turkish War of 1877 and the Greco-Turkish War of 1897 witnessed the employment of a large

proportion of the sultan's available forces, while innumerable local revolts in different parts of the empire called for great exertions, and often for fierce fighting on the part of the troops locally in garrison and those sent up from the nearest provinces.

United States Army

99. The regular army of the United States has always been small. From the first it has been a voluntary force, and until 1898 its chief work in peace was to furnish numerous small posts on the frontier and amongst the Indians, and to act as a reserve to the civil power in the great cities. In war-time the regular army, if, as was usually the case, it was insufficient in numbers for the task of subduing the enemy, formed the nucleus of large armies raised "for the war." In 1790 the rank and file of the army, as fixed by act of Congress, amounted to 1216 men; and in 1814 an English expedition of only 3500 men was able to seize and burn Washington, the capital of a country which even then numbered eight millions of inhabitants. In 1861, at the beginning of the Civil War, the whole regular force amounted to about 15,300 men. In April of that year the president called out 75,000 volunteers for three months; and in May a further call for 42,000 was made. In July a call for 500,000 men was authorized by Congress, and as even this vast force proved insufficient it was found necessary to use a system of drafts. In October 1863 a levy of 300,000 men was ordered, and in February 1864 a further call of 500,000 was made. Finally, in the beginning of 1865 two further levies, amounting in all to 500,000 men, were ordered, but were only partially carried out in consequence of the cessation of hostilities. The total number of men called under arms by the government of the United States, between April 1861 and April 1865, amounted to 2,759,049, of whom 2,656,053 were actually embodied in the armies. If to these be added the 1,100,000 men embodied

by the South during the same time, the total armed forces reach the enormous amount of nearly four millions, drawn from a population of only 32 millions—figures before which the celebrated uprising of the French nation in 1793, or the efforts of France and Germany in the Franco-German War, sink into insignificance. These 2,700,000 Federals were organized into volunteer regiments bearing state designations. The officers, except general and staff officers, were appointed by the governors of the respective states. The maximum authorized strength of the regular army never, during the war, exceeded 40,000 men; and the number in the field, especially towards the close of the war, was very much less. The states, in order to obtain men to fill their quotas, offered liberal bounties to induce men to enlist, and it therefore became very difficult to obtain recruits for the regular army, for which no bounties were given. The regular regiments accordingly dwindled away to skeletons. The number of officers present was also much reduced, since many of them, while retaining their regular commissions, held higher rank in the volunteer army. After the close of the Civil War the volunteers were mustered out; and by the act of Congress of the 28th of July 1866 the line of the army was made to consist of 10 regiments of cavalry of 12 troops each, 5 regiments of artillery of 12 batteries each and 45 regiments of infantry of 10 companies. The actual strength in August 1867 was 53,962. The act of the 3rd of March 1869 reduced the number of infantry regiments to 25 and the enlisted strength of the army to 35,036. The numbers were further reduced, without change in organization, to 32,788 in 1870 and to 25,000 in 1874. The latter number remained the maximum for twenty-four years.

In March 1898, in view of hostilities with Spain, the artillery was increased by 2 regiments, and, in April, 2 companies were added to each infantry regiment, giving it 3 battalions of 4 companies each. The strength of batteries, troops and companies was increased, the maximum enlisted strength reached during 1898 being over 63,000. A volunteer army was also

organized. Of this army, 3 regiments of engineer troops, 3 of cavalry and 10 of infantry were United States volunteers, all the officers being commissioned by the president. The other organizations came from the states, the officers being appointed by the respective governors. As fast as they were organized and filled up, they were mustered into the service of the United States. The total number furnished for the war with Spain was 10,017 officers and 213,218 enlisted men. All general and staff officers were appointed by the president. Three hundred and eighty-seven officers of the regular army received volunteer commissions. After the conclusion of hostilities with Spain, the mustering out of the volunteers was begun, and by June 1899 all the volunteers, except those in the Philippines, were out of the service. The latter, as well as those serving elsewhere, having enlisted only for the war, were brought home and mustered out as soon as practicable.

The act of the 2nd of March 1899 added 2 batteries to each regiment of artillery. On the 2nd of February 1901 Congress passed an important bill providing for the reorganization and augmentation (max. 100,000) of the regular army, and other measures followed in the next years. (See UNITED STATES.)

MINOR ARMIES

100. *Dutch and Belgian Armies.*—The military power of the "United Provinces" dates its rise from the middle of the 16th century, when, after a long and sanguinary struggle, they succeeded in emancipating themselves from the yoke of Spain; and in the following century it received considerable development in consequence of the wars they had to maintain against Louis XIV. In 1702 they had in their pay upwards of 100,000 men, including many English and Scottish

regiments, besides 30,000 in the service of the Dutch East India Company. But the slaughter of Malplaquet deprived the republic of the flower of the army. Its part in the War of the Austrian Succession was far from being as creditable as its earlier deeds, a Prussian army overran Holland in 1787 almost without opposition, and at the beginning of the wars of the French Revolution the army had fallen to 36,000 men. In 1795 Holland was conquered by the French under Pichegru, and in the course of the changes which ensued the army was entirely reorganized, and under French direction bore its share in the great wars of the empire.

With the fall of Napoleon and the reconstitution of the Netherlands, the Dutch-Belgian army, formed of the troops of the now united countries, came into existence. The army fought at Waterloo, but was not destined to a long career, for the revolution of 1830 brought about the separation of Belgium. A Dutch garrison under Baron Chassé, a distinguished veteran of the Napoleonic wars, defended Antwerp against the French under Marshal Gérard, and the Netherlands have been engaged in many arduous colonial wars in the East Indies. The Belgian army similarly has contributed officers and non-commissioned officers to the service of the Congo Free State.

101. *Swiss Army.*—The inhabitants of Switzerland were always a hardy and independent race, but their high military reputation dates from the middle of the 15th century, when the comparatively ill-armed and untrained mountaineers signally defeated Charles the Bold of Burgundy and the flower of the chivalry of Europe in the battles of Granson, Morat and Nancy. The Swabian war, towards the end of that century, and the Milanese war, at the beginning of the following one, added to the fame of the Swiss infantry, and made it the model on which that arm was formed all over Europe. The wealthier countries

vied with each other in hiring them as mercenaries, and the poor but warlike Swiss found the profession of arms a lucrative one.

A brief account of the Swiss mercenaries will be found earlier in this article. Their fall was due in the end to their own indiscipline in the first place, and the rise of the Spanish standing army and its musketeers in the second. Yet it does not seem that the military reputation of the Swiss was discredited, even by reverses such as Marignan. On the contrary, they continued all through the 17th and 18th centuries to furnish whole regiments for the service of other countries, notably of France, and individuals, like Jomini in a later age, followed the career of the soldier of fortune everywhere. The most notable incident in the later military history of the Swiss, the heroic faithfulness of Louis XVI.'s Swiss guard, is proverbial, and has been commemorated with just pride by their countrymen. The French Revolutionary armies overran Switzerland, as they did all the small neighbouring states, and during Napoleon's career she had to submit to his rule, and furnish her contingent to his armies. On the fall of Napoleon she regained her independence, and returned to her old trade of furnishing soldiers to the sovereigns and powers of Europe. Charles X. of France had at one time as many as 17,000 Swiss in his pay; Naples and Rome had each four regiments. The recruiting for these foreign services was openly acknowledged and encouraged by the government. The young Swiss engaged usually for a period of four or six years; they were formed in separate regiments, officered by countrymen of their own, and received a higher rate of pay than the national regiments; and at the close of their engagement returned with their earnings to settle down on their paternal holdings. A series of revolutions, however, expelled them from France and Italy, and recently the advance of liberal ideas, and the creation of great national armies based on the principle of personal service, has destroyed their occupation. Switzerland is now remarkable

in a military sense as being the only country that maintains no standing army (see Militia).

102. The *Swedish Army* can look back with pride to the days of Gustavus Adolphus and of Charles XII. The contributions made by it to the military science of the 17th century have been noticed above. The triumphs of the small and highly disciplined army of Charles were often such as to recall the similar victories of the Greeks under Alexander. The then nebulous armies of Russia and Poland resembled indeed the forces of Darius in the 4th century B.C., but Peter the Great succeeded at last in producing a true army, and the resistance of the Swedes collapsed under the weight of the vastly superior numbers then brought against them.

The *Danish Army* has a long and meritorious record of good service dating from the Thirty Years' War.

103. The existing Army of *Portugal* dates from the Peninsular War, when a considerable force of Portuguese, at one time exceeding 60,000 men, was organized under Marshal Beresford. Trained and partly officered by English officers, it proved itself not unworthy of its allies, and bore its full share in the series of campaigns and battles by which the French were ultimately expelled from Spain. At the peace the army numbered about 50,000 infantry and 5000 cavalry, formed on the English model, and all in the highest state of efficiency. This force was reduced in 1821, under the new constitutional government, to about one-half.

104. The *Rumanian, Bulgarian* and *Servian* armies are the youngest in Europe. The conduct of the Rumanians before Plevna in 1877 earned for them the respect of soldiers of all countries. Servia and Bulgaria came to war in 1885, and the Bulgarian soldiers, under the most

adverse conditions, achieved splendid victories under the leadership of their own officers. In the crisis following the Austrian annexation of Bosnia-Herzegovina (1908-9), it seemed likely that the Servian forces might play an unexpectedly active part in war even with a strong power.

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1 The phrase "K. und K." (*Kaiserlich und Königlich*) is applied to all services common to the Austrian and Hungarian armies. "K.-K." (*Kaiserlich-Königlich*) refers strictly only to the troops of Austria, the Hungarian army being known as the "K. Ung." (Royal Hungarian) service.

2 From *Krümperpferde* (cast horses attached to batteries, &c., for odd jobs), applied to the recruits in jest.

ARNAL, ÉTIENNE (1794-1872), French actor, was born at Meulan, Seine-et-Oise, on the 1st of February 1794. After serving in the army, and working in a button factory, he took to the stage. His first appearance (1815) was in tragedy, and for some time he was unsuccessful; it was not until 1827 that he showed his real ability in comedy parts, especially in plays by Félix August Duvert (1795-1876) and Augustin Théodore Lauzanne (1805-1877), whose *Cabinets particuliers* (1832), *Le Mari de la dame de chœurs* (1837), *Passé minuit, L'Homme blasé* (1843), *La Clef dans le dos* (1848), &c., contained parts written for him. He was twenty years at the Vaudeville, and completed at the various Parisian theatres a stage career of nearly half a century. Arnal was the author of *Epître à bouffé* (1840), which is reprinted in his volume of poetry, *Boutades en vers* (1861).

ARNALDUS DE VILLA NOVA, also called ARNALDUS DE VILLANUEVA, ARNALDUS VILLANOVANUS or ARNAUD DE VILLENEUVE (*c.* 1235-1313), alchemist, astrologer and physician, appears to have been of Spanish origin, and to have studied chemistry, medicine, physics, and also Arabian philosophy. After having lived at the court of Aragon, he went to Paris, where he gained a considerable reputation; but he incurred the enmity of the ecclesiastics and was forced to flee, finally finding an asylum in Sicily. About 1313 he was summoned to Avignon by Pope Clement V., who was ill, but he died on the voyage. Many alchemical writings, including *Thesaurus Thesaurorum* or *Rosarius Philosophorum, Novum Lumen, Flos Florum*, and *Speculum Alchimiae*, are ascribed to him, but they are of very doubtful authenticity. Collected editions of them were published at Lyons in 1504 and 1532 (with a biography by Symphorianus Campegius), at Basel in 1585, at Frankfort in 1603, and at Lyons in 1686. He is also the reputed author of various medical works, including *Breviarium Practicae*.

See J.B. Hauréau in the *Histoire littéraire de la France* (1881), vol. 28; E. Lalande, *Arnaud de Villeneuve, sa vie et ses œuvres* (Paris, 1896). A list of writings is given by J. Ferguson in his *Bibliotheca Chemica* (1906). See also U. Chevalier, *Repertoire des sources hist., &c., Bio-bibliographie* (Paris, 1903).

ARNAUD, HENRI (1641-1721), pastor and general of the Vaudois or Waldensians of Piedmont, was born at Embrun. About 1650 his family returned to their native valley of Luserna, where Arnaud was educated at La Tour (the chief village), later visiting the college at Basel (1662 and 1668) and the Academy at Geneva (1666). He then returned home, and seems to have been pastor in several of the Vaudois valleys before attaining that position at La Tour (1685). He was thus the natural leader of his co-religionists after Victor Amadeus expelled them (1686) from their valleys, and most probably visited Holland, the ruler of which, William of Orange, certainly gave him help and money. Arnaud occupied himself with organizing his 3000 countrymen who had taken refuge in Switzerland, and who twice (1687-1688) attempted to regain their homes. The English revolution of 1688, and the election of William to the throne, encouraged the Vaudois to make yet another attempt. Furnished with detailed instructions from the veteran Josué Janavel (prevented by age from taking part in the expedition) Arnaud, with about 1000 followers, started (August 17, 1689) from near Nyon on the Lake of Geneva for the *glorieuse rentrée*. On the 27th of August, the valiant band, after many hardships and dangers, reached the Valley of St Martin, having passed by Sallanches and crossed the Col de Very (6506 ft.), the Enclave de la Fenêtre (7425 ft.), the Col du Bonhomme (8147 ft.), the Col du Mont Iseran (9085 ft.), the Grand Mont Cenis (6893 ft.), the Petit Mont Cenis (7166 ft.), the Col de Clapier (8173 ft.), the Col de Côteplane (7589 ft.), and the Col du Piz (8550 ft.). They soon took refuge in the lofty and secure rocky citadel of the Balsille, where they were besieged (October 24, 1689 to May 14, 1690) by the troops (about 4000 in number) of the king of France and the duke of Savoy. They maintained this natural fortress against many fierce attacks and during the whole of a winter. In particular, on the 2nd of May, one assault was defeated without the loss of a single man of Arnaud's small band. But another attack (May 14) was not so successful, so that Arnaud withdrew his force, under

cover of a thick mist, and led them over the hills to the valley of Angrogna, above La Tour. A month later the Vaudois were received into favour by the duke of Savoy, who had then abandoned his alliance with France for one with Great Britain and Holland. Hence for the next six years the Vaudois helped Savoy against France, though suffering much from the repeated attacks of the French troops. But by a clause in the treaty of peace of 1696, made public in 1698, Victor Amadeus again became hostile to the Vaudois, about 3000 of whom, with Arnaud, found a shelter in Protestant countries, mainly in Württemberg, where Arnaud became the pastor of Dürrmenz-Schönenberg, N.W. of Stuttgart (1699). Once again (1704-1706) the Vaudois aided the duke against France. Arnaud, however, took no part in the military operations, though he visited England (1707) to obtain pecuniary aid from Queen Anne. He died at Schönenberg (which was the church hamlet of the parish of Dürrmenz) in 1721. It was during his retirement that he compiled from various documents by other hands his *Histoire de la glorieuse rentrée des Vaudois dans leurs vallées*, which was published (probably at Cassel) in 1710, with a dedication to Queen Anne. It was translated into English (1827) by H. Dyke Acland, and has also appeared in German and Dutch versions. A part of the original MS. is preserved in the Royal Library in Berlin.

See K.H. Klaiber, *Henri Arnaud, ein Lebensbild* (Stuttgart, 1880); A. de Rochas d'Aiglun, *Les Vallées vaudoises* (Paris, 1881); various chapters in the *Bulletin du bicentenaire de la glorieuse rentrée* (Turin, 1889).

(W. A. B. C.)

ARNAULD, the surname of a family of prominent French lawyers, chiefly remembered in connexion with the Jansenist troubles of the 17th century. At their head was ANTOINE ARNAULD (1560-1619), a leader of the Paris bar; in this capacity he delivered a famous philippic against the Jesuits in 1594, accusing them of gross disloyalty to the newly converted Henry IV. This speech was afterwards known as the original sin of the Arnaulds.

Of his twenty children several grew up to fight the Jesuits on more important matters. Five gave themselves up wholly to the church. HENRI ARNAULD (1597-1692), the second son, became bishop of Angers in 1649, and represented Jansenism on the episcopal Bench for as long as forty-three years. The youngest son, ANTOINE (1612-1694), was the most famous of Jansenist theologians (see below). The second daughter, ANGÉLIQUE (1591-1661), was abbess and reformer of Port Royal; here she was presently joined by her sister AGNES (1593-1671) and two younger sisters, both of whom died early.

Only two of Antoine's children married—ROBERT ARNAULD D'ANDILLY (1588-1674), the eldest son, and CATHERINE LEMAISTRE (1590-1651), the eldest daughter. But both of these ended their lives under the shadow of the abbey. Andilly's five daughters all took the veil there; the second, ANGÉLIQUE DE ST JEAN ARNAULD D'ANDILLY (1624-1684) rose to be abbess, was a writer of no mean repute, and one of the most remarkable figures of the second generation of Jansenism. One of Andilly's sons became a hermit at Port Royal; the eldest, ANTOINE (1615-1699), was first a soldier, afterwards a priest. As the Abbé Arnauld, he survives as author of some interesting *Memoirs* of his time. The second son, SIMON ARNAULD DE POMPONNE (1616-1699), early entered public life. After holding various embassies, he rose to be foreign secretary to Louis XIV., and was created marquis de Pomponne. Lastly Madame Lemaistre and two of her sons became identified with Port Royal. On her husband's death she took the veil

there. Her eldest son, Antoine Lemaistre (1608-1658), became the first of the *solitaires*, or hermits of Port Royal. There he was joined by his younger brother, Isaac Lemaistre de Saci (1613-1684), who presently took holy orders, and became confessor to the hermits.

The Arnaulds' connexion with Port Royal (*q.v.*)—a convent of Cistercian nuns in the neighbourhood of Versailles—dated back to 1599, when the original Antoine secured the abbess's chair for his daughter Angélique, then a child of eight. About 1608 she started to reform her convent in the direction of its original Rule; but about 1623 she made the acquaintance of du Vergier (*q.v.*) and thenceforward began to move in a Jansenist direction. Her later history is entirely bound up with the fortunes of that revival. Angélique's strength lay chiefly in her character. Her sister and collaborator, Agnes, was also a graceful writer; and her *Letters*, edited by Prosper Feugère (2 vols., Paris, 1858), throw most valuable light on the inner aims and aspirations of the Jansenist movement. The first relative to join their projects of reform was their nephew, Antoine Lemaistre, who threw up brilliant prospects at the bar to settle down at the Abbey gates (1638). Here he was presently joined by his brother, de Saci, and other hermits, who led an austere semi-monastic existence, though without taking any formal vow. In 1646 they were joined by their uncle, Arnauld d'Andilly, hitherto a personage of some importance at court and in the world; he was a special favourite of the queen regent, Anne of Austria, and had held various offices of dignity in the government. Uncle and nephews passed their time partly in ascetic exercises—though Andilly never pretended to vie in austerity with the younger men—partly in managing the convent estates, and partly in translating religious classics. Andilly put Josephus, St Augustine's *Confessions*, and many other works, into singularly delicate French. Lemaistre attacked the lives of the saints; in 1654 Saci set to work on a translation of the Bible. His labours were interrupted by the outbreak of persecution. In 1661 he was forced to go into

hiding; in 1666 he was arrested, thrown into the Bastille, and kept there more than two years. Meanwhile his friends printed his translation of the New Testament—really in Holland, nominally at Mons in the Spanish Netherlands (1667). Hence it is usually known as the *Nouveau Testament de Mons*. It found enthusiastic friends and violent detractors. Bossuet approved its orthodoxy, but not its over-elaborate style; and it was destructively criticized by Richard Simon, the founder of Biblical criticism in France. On the other hand it undoubtedly did much to popularize the Bible, and was bitterly attacked by the Jesuits on that ground.

By far the most distinguished of the family, however, was Antoine—*le grand* Arnauld, as contemporaries called him—the twentieth and youngest child of the original Antoine. Born in 1612, he was originally intended for the bar; but decided instead to study theology at the Sorbonne. Here he was brilliantly successful, and was on the high-road to preferment, when he came under the influence of du Vergier, and was drawn in the direction of Jansenism. His book, *De la fréquente Communion* (1643), did more than anything else to make the aims and ideals of this movement intelligible to the general public. Its appearance raised a violent storm, and Arnauld eventually withdrew into hiding; for more than twenty years he dared not make a public appearance in Paris. During all this time his pen was busy with innumerable Jansenist pamphlets. In 1655 two very outspoken *Lettres à un duc et pair* on Jesuit methods in the confessional brought on a motion to expel him from the Sorbonne. This motion was the immediate cause of Pascal's *Provincial Letters*. Pascal, however, failed to save his friend; in February 1656 Arnauld was solemnly degraded. Twelve years later the tide of fortune turned. The so-called peace of Clement IX. put an end to persecution. Arnauld emerged from his retirement, was most graciously received by Louis XIV., and treated almost as a popular hero. He now set to work with Nicole (*q.v.*) on a great work against the Calvinists: *La*

Le grand Arnauld.

Perpétuité de la foi catholique touchant l'eucharistie. Ten years later, however, another storm of persecution burst. Arnauld was compelled to fly from France, and take refuge in the Netherlands, finally settling down at Brussels. Here the last sixteen years of his life were spent in incessant controversy with Jesuits, Calvinists and misbelievers of all kinds; here he died on the 8th of August 1694. His inexhaustible energy is best expressed by his famous reply to Nicole, who complained of feeling tired. "Tired!" echoed Arnauld, "when you have all eternity to rest in?" Nor was this energy by any means absorbed by purely theological questions. He was one of the first to adopt the philosophy of Descartes, though with certain orthodox reservations; and between 1683 and 1685 he had a long battle with Malebranche on the relation of theology to metaphysics. On the whole, public opinion leant to Arnauld's side. When Malebranche complained that his adversary had misunderstood him, Boileau silenced him with the question: "My dear sir, whom do you expect to understand you, if M. Arnauld does not?" And popular regard for Arnauld's penetration was much increased by his *Art de penser*, commonly known as the *Port-Royal Logic*, which has kept its place as an elementary text-book until quite modern times. Lastly a considerable place has quite lately been claimed for Arnauld among the mathematicians of his age; a recent critic even describes him as the Euclid of the 17th century. In general, however, since his death his reputation has been steadily on the wane. Contemporaries admired him chiefly as a master of close and serried reasoning; herein Bossuet, the greatest theologian of the age, was quite at one with d'Aguesseau, the greatest lawyer. But a purely controversial writer is seldom attractive to posterity. Anxiety to drive home every possible point, and cut his adversary off from every possible line of retreat, makes him seem intolerably prolix. "In spite of myself," Arnauld once said regretfully, "my books are seldom very short." And even lucidity may prove a snare to those who trust to it alone, and scornfully refuse to appeal to the imagination or the feelings. It is

to be feared that, but for his connexion with Pascal, Arnauld's name would be almost forgotten—or, at most, live only in the famous epitaph Boileau consecrated to his memory—

"Au pied de cet autel de structure grossière
Gît sans pompe, enfermé dans une vile bière
Le plus savant mortel qui jamais ait écrit."

Full details as to the lives and writings of the Arnaulds will be found in the various books mentioned at the close of the article on Port Royal. The most interesting account of Angélique will be found in *Mémoires pour servir a l'histoire de Port-Royal* (3 vols., Utrecht 1742). Three volumes of her correspondence were also published at the same time and place. There are excellent modern lives of her in English by Miss Frances Martin (*Angélique Arnauld*, 1873) and by A. K. H. (*Angélique of Port Royal*, 1905). Antoine Arnauld's complete works—thirty-seven volumes in forty-two parts—were published in Paris, 1775-1781. No modern biography of him exists; but there is a study of his philosophy in Bouillier, *Histoire de la philosophie cartésienne* (Paris, 1868); and his mathematical achievements are discussed by Dr Bopp in the 14th volume of the *Abhandlungen zur Geschichte der mathematischen Wissenschaften* (Leipzig, 1902). The memoirs of Arnauld d'Andilly and of his son, the abbé Arnauld, are reprinted both in Petitot's and Poujoulat's collections of memoirs illustrative of the 17th century.

(ST. C.)

ARNAULT, ANTOINE VINCENT (1766-1834), French dramatist, was born in Paris in January 1766. His first play, *Marius à Minturnes* (1791), immediately established his reputation. A year later he followed up his first success with a second republican tragedy, *Lucrèce*. He left France during the Terror and on his return was arrested by the revolutionary authorities, but was liberated through the intervention of Fabre d'Eglantine and others. He was commissioned by Bonaparte in 1797 with the reorganization of the Ionian Islands, and was nominated to the Institute and made secretary general of the university. He was faithful to his patron through his misfortunes, and after the Hundred Days remained in exile until 1819. In 1829 he was re-elected to the Academy and became perpetual secretary in 1833. Others of his plays are *Blanche et Montcassin, ou les Vénitiens* (1798); and *Germanicus* (1816), the performance of which was the occasion of a disturbance in the *parterre* which threatened serious political complications. His tragedies are perhaps less known now than his *Fables* (1813, 1815 and 1826), which are written in very graceful verse. Arnault collaborated in a *Vie politique et militaire de Napoléon* (1822), and wrote some very interesting *Souvenirs d'un sexagénaire* (1833), which contain much out-of-the-way information about the history of the years previous to 1804. Arnault died at Goderville on the 16th of September 1834.

His eldest son, Émilien Lucien (1787-1863), wrote several tragedies, the leading rôles in which were interpreted by Talma.

See Sainte-Beuve, *Causeries du lundi*, vol. 7. Arnault's *Œuvres complètes* (4 vols.) were published at the Hague and Paris in 1818-1819 and again (8 vols.) at Paris in 1824.

ARNDT, ERNST MORITZ (1769-1860), German poet and patriot, was born on the 26th of December 1769 at Schoritz in the island of Rügen, which at that time belonged to Sweden. He was the son of a prosperous farmer, and emancipated serf of the lord of the district, Count Putbus; his mother came of well-to-do German yeoman stock. In 1787 the family removed into the neighbourhood of Stralsund, where Arndt was enabled to attend the academy. After an interval of private study he went in 1791 to the university of Greifswald as a student of theology and history, and in 1793 removed to Jena, where he fell under the influence of Fichte. On the completion of his university course he returned home, was for two years a private tutor in the family of Ludwig Kosegarten (1758-1818), pastor of Wittow and poet, and having qualified for the ministry as a "candidate of theology," assisted in the church services. At the age of twenty-eight he renounced the ministry, and for eighteen months he led a wandering life, visiting Austria, Hungary, Italy, France and Belgium. Returning homewards up the Rhine, he was moved by the sight of the ruined castles along its banks to intense bitterness against France. The impressions of this journey he later described in *Reisen durch einen Theil Teutschlands, Ungarns, Italiens und Frankreichs in den Jahren 1798 und 1799* (1802-1804). In 1800 he settled in Greifswald as *privat-docent* in history, and the same year published *Über die Freiheit der alien Republiken*. In 1803 appeared *Germanien und Europa*," a fragmentary ebullition," as be himself called it, of his views on the French aggression. This was followed by one of the most remarkable of his books, *Versuch einer Geschichte der Leibeigenschaft in Pommern und Rügen* (Berlin, 1803), a history of serfdom in Pomerania and Rügen, which was so convincing an indictment that King Gustavus Adolphus IV. in 1806 abolished the evil. Arndt had meanwhile risen from *privat-docent* to extraordinary professor, and in 1806 was appointed to the chair of history at the university. In this year he published the first part of his *Geist der Zeit*, in which he flung down the

gauntlet to Napoleon and called on his countrymen to rise and shake off the French yoke. So great was the excitement it produced that Arndt was compelled to take refuge in Sweden to escape the vengeance of Napoleon. Settling in Stockholm, he obtained government employment, but devoted himself to the great cause which was nearest his heart, and in pamphlets, poems and songs communicated his enthusiasm to his countrymen. Schill's heroic death at Stralsund impelled him to return to Germany and, under the disguise of "Almann, teacher of languages," he reached Berlin in December 1809. In 1810 he returned to Greifswald, but only for a few months. He again set out on his adventurous travels, lived in close contact with the first men of his time, such as Blücher, Gneisenau and Stein, and in 1812 was summoned by the last named to St Petersburg to assist in the organization of the final struggle against France. Meanwhile, pamphlet after pamphlet, full of bitter hatred of the French oppressor, came from his pen, and his stirring patriotic songs, such as *Was ist das deutsche Vaterland? Der Gott, der Eisen wachsen liess*, and *Was blasen die Trompeten?* were on all lips. When, after the peace, the university of Bonn was founded in 1818, Arndt was appointed to the chair of modern history. In this year appeared the fourth part of his *Geist der Zeit*, in which he criticized the reactionary policy of the German powers. The boldness of his demands for reform offended the Prussian government, and in the summer of 1819 he was arrested and his papers confiscated. Although speedily liberated, he was in the following year, at the instance of the Central Commission of Investigation at Mainz, established in accordance with the Carlsbad Decrees, arraigned before a specially constituted tribunal. Although not found guilty, he was forbidden to exercise the functions of his professorship, but was allowed to retain the stipend. The next twenty years he passed in retirement and literary activity. In 1840 he was reinstated in his professorship, and in 1841 was chosen rector of the university. The revolutionary outbreak of 1848 rekindled in the venerable patriot his old

hopes and energies, and he took his seat as one of the deputies to the National Assembly at Frankfort. He formed one of the deputation that offered the imperial crown to Frederick William IV., and indignant at the king's refusal to accept it, he retired with the majority of von Gagern's adherents from public life. He continued to lecture and to write with freshness and vigour, and on his 90th birthday received from all parts of Germany good wishes and tokens of affection. He died at Bonn on the 29th of January 1860. Arndt was twice married, first in 1800, his wife dying in the following year; a second time in 1817.

Arndt's untiring labour for his country rightly won for him the title of "the most German of all Germans." His lyric poems are not, however, all confined to politics. Many among the Gedichte (1803-1818; complete edition, 1860) are religious pieces of great beauty. Among his other works are *Reise durch Schweden* (1797); *Nebenstunden, eine Beschreibung und Geschichte der schottländischen Inseln und der Orkaden* (1820); *Die Frage über die Niederlande* (1831); *Erinnerungen aus dem äusseren Leben* (an autobiography, and the most valuable source of information for Arndt's life, 1840); *Rhein- und Ahrwanderungen* (1846), *Wanderungen und Wandlungen mit dem Reichsfreiherrn von Stein* (1858), and *Pro populo Germanico* (1854), which was originally intended to form the fifth part of the *Geist der Zeit*. Arndt's *Werke* have been edited by H. Rösch and H. Meisner in 8 vols. (not complete) (1892-1898). Biographies have been written by E. Langenberg (1869) and Wilhelm Baur (5th ed., 1882); see also H. Meisner and R. Geerds, *E.M. Arndt, ein Lebensbild in Briefen* (1898), and R. Thiele, *E.M. Arndt* (1894). There are monuments to his memory at Schoritz, his birthplace, and at Bonn, where he is buried.

ARNDT, JOHANN (1555-1621), German Lutheran theologian, was born at Ballenstedt, in Anhalt, and studied in several universities. He was at Helmstadt in 1576; at Wittenberg in 1577. At Wittenberg the crypto-Calvinist controversy was then at its height, and he took the side of Melanchthon and the crypto-Calvinists. He continued his studies in Strassburg, under the professor of Hebrew, Johannes Pappus (1549-1610), a zealous Lutheran, the crown of whose life's work was the forcible suppression of Calvinistic preaching and worship in the city, and who had great influence over him. In Basel, again, he studied theology under Simon Sulzer (1508-1585), a broad-minded divine of Lutheran sympathies, whose aim was to reconcile the churches of the Helvetic and Wittenberg confessions. In 1581 he went back to Ballenstedt, but was soon recalled to active life by his appointment to the pastorate at Badeborn in 1583. After some time his Lutheran tendencies exposed him to the anger of the authorities, who were of the Reformed Church. Consequently, in 1590 he was deposed for refusing to remove the pictures from his church and discontinue the use of exorcism in baptism. He found an asylum in Quedlinburg (1590), and afterwards was transferred to St Martin's church at Brunswick (1599). Arndt's fame rests on his writings. These were mainly of a mystical and devotional kind, and were inspired by St Bernard, J. Tauler and Thomas à Kempis. His principal work, *Wahres Christentum* (1606-1609), which has been translated into most European languages, has served as the foundation of many books of devotion, both Roman Catholic and Protestant. Arndt here dwells upon the mystical union between the believer and Christ, and endeavours, by drawing attention to Christ's life *in* His people, to correct the purely forensic side of the Reformation theology, which paid almost exclusive attention to Christ's death *for* His people. Like Luther, Arndt was very fond of the little anonymous book, *Deutsche Theologie*. He published an edition of it and called attention to its merits in a special preface. After *Wahres Christentum*, his best-known work is

Paradiesgärtlein aller christlichen Tugenden, which was published in 1612. Both these books have been translated into English; *Paradiesgärtlein* with the title the *Garden of Paradise*. Several of his sermons are published in R. Nesselmann's *Buch der Predigten* (1858). Arndt has always been held in very high repute by the German Pietists. The founder of Pietism, Philipp Jacob Spener, repeatedly called attention to him and his writings, and even went so far as to compare him with Plato (cf. Karl Scheele, *Plato und Johann Arndt, Ein Vortrag, &c.*, 1857).

A collected edition of his works was published in Leipzig and Görlitz in 1734. A valuable account of Arndt is to be found in C. Aschmann's *Essai sur la vie, &c., de J. Arndt*. See further, Herzog-Hauck, *Realencyklopadie*.

ARNE, THOMAS AUGUSTINE (1710-1778), English musical composer, was born in London on the 12th of March 1710, his father being an upholsterer. Intended for the legal profession, he was educated at Eton, and afterwards apprenticed to an attorney for three years. His natural inclination for music, however, proved irresistible, and his father, finding from his performance at an amateur musical party that he was already a skilful violinist, furnished him with the means of educating himself in his favourite art. On the 7th of March 1733 he produced his first work at Lincoln's Inn Fields theatre, a setting of Addison's *Rosamond*, the heroine's part being performed by his sister, Susanna Maria, who afterwards became celebrated as Mrs Gibber. This proving a success was immediately followed by a burletta, entitled *The Opera of Operas*, based on Fielding's *Tragedy of*

Tragedies. The part of Tom Thumb was played by Arne's young brother, and the opera was produced at the Haymarket theatre. On the 19th of December 1733 Arne produced at the same theatre the masque *Dido and Aeneas*, a subject of which the musical conception had been immortalized for Englishmen more than half a century earlier by Henry Purcell. Arne's individuality of style first distinctly asserted itself in the music to Dr Dalton's adaptation of Milton's *Comus*, which was performed at Drury Lane in 1738, and speedily established his reputation. In 1740 he wrote the music for Thomson and Mallet's *Masque of Alfred*, which is noteworthy as containing the most popular of all his airs—"Rule, Britannia!" In 1740 he also wrote his beautiful settings of the songs, "Under the greenwood tree," "Blow, blow, thou winter wind" and "When daisies pied," for a performance of Shakespeare's *As You Like It*. Four years before this, in 1736, he had married Cecilia, the eldest daughter of Charles Young, organist of All Hallows Barking. She was considered the finest English singer of the day and was frequently engaged by Handel in the performance of his music. In 1742 Arne went with his wife to Dublin, where he remained two years and produced his oratorio *Abel*, containing the beautiful melody known as the Hymn of Eve, the operas *Britannia, Eliza* and *Comus*, and where he also gave a number of successful concerts. On his return to London he was engaged as leader of the band at Drury Lane theatre (1744), and as composer at Vauxhall (1745). In this latter year he composed his successful pastoral dialogue, *Colin and Phoebe*, and in 1746 the song, "Where the bee sucks." In 1759 he received the degree of doctor of music from Oxford. In 1760 he transferred his services to Covent Garden theatre, where on the 28th of November he produced his *Thomas and Sally*. Here, too, on the 2nd of February 1762 he produced his *Artaxerxes*, an opera in the Italian style with recitative instead of spoken dialogue, the popularity of which is attested by the fact that it continued to be performed at intervals for upwards of eighty years. The libretto, by Arne himself, was a very poor

translation of Metastasio's *Artaserse*. In 1762 also was produced the ballad-opera *Love in a Cottage*. His oratorio *Judith*, of which the first performance was on the 27th of February 1761 at Drury Lane, was revived at the chapel of the Lock hospital, Pimlico, on the 29th of February 1764, in which year was also performed his setting of Metastasio's *Olimpiade* in the original language at the King's theatre in the Haymarket. At a later performance of *Judith* at Covent Garden theatre on the 26th of February 1773 Arne for the first time introduced female voices into oratorio choruses. In 1769 he wrote the musical parts for Garrick's ode for the Shakespeare jubilee at Stratford-on-Avon, and in 1770 he gave a mutilated version of Purcell's *King Arthur*. One of his last dramatic works was the music to Mason's *Caractacus*, published in 1775. Though inferior to Purcell in intensity of feeling, Arne has not been surpassed as a composer of graceful and attractive melody. There is true genius in such airs as "Rule, Britannia!" and "Where the bee sucks," which still retain their original freshness and popularity. As a writer of glees he does not take such high rank, though he deserves notice as the leader in the revival of that peculiarly English form of composition. He was author as well as composer of *The Guardian outwitted*, *The Rose*, *The Contest of Beauty and Virtue*, and *Phoebe at Court*. Dr Arne died on the 5th of March 1778, and was buried at St Paul's, Covent Garden.

See also the article in *Grove's Dictionary* (new ed.); and two interesting papers in the *Musical Times*, November and December 1901.

ARNETH, ALFRED, RITTER VON (1819-1897), Austrian historian, born at Vienna on the both of July 1819, was the son of Joseph Calasanza von Arneth (1791-1863), a well-known historian and archaeologist, who wrote a history of the Austrian empire (Vienna, 1827) and several works on numismatics. Alfred Arneth studied law, and became an official of the Austrian state archives, of which in 1868 he was appointed keeper. He was a moderate liberal in politics and a supporter of the ideal of German unity. As such he was elected to the Frankfort parliament in 1848. In 1861 he became a member of the Lower Austrian diet and in 1869 was nominated to the Upper House of the Austrian Reichsrath. In 1879 he was appointed president of the *Kaiserliche Akademie der Wissenschaften* (Academy of Sciences) at Vienna, and in 1896 succeeded von Sybel as chairman of the historical commission at Münich. He died on the 30th of July 1897.

Arneth was an indefatigable worker, and, as director of the archives, his broad-minded willingness to listen to the advice of experts, as well as his own sound sense, did much to promote the more scientific treatment and use of public records in most of the archives of Europe. His scientific temper and the special facilities which he enjoyed for drawing from original sources give to his numerous historical works a very special value.

Among his publications may be mentioned: *Leben des Feldmarschalls Grafen Guido Starhemberg* (Vienna, 1863); *Prinz Eueen von Savoyen* (3 vols., *ib*. 1864); *Gesch. der Maria Theresa* (10 vols., *ib*. 1863-1879); *Maria Theresa u. Marie Antoinette, ihr Briefwechsel* (*ib*. 1866); *Marie Antoinette, Joseph II. und Leopold II., ihr Briefwechsel* (1866); *Maria Theresa und Joseph II., ihre Korrespondenz samt Briefen Josephs an seinen Bruder Leopold* (3 vols., 1867); *Beaumarchais und Sonnenfels* (1868); *Joseph II. und Katharina von Russland, ihr Briefwechsel* (1869); *Johann Christian Barthenstein und seine Zeit* (1871); *Joseph II. und Leopold von*

Toskana, ihr Briefwechsel (2 vols., 1872); *Briefe der Kaiserin Maria Theresa an ihre Kinder und Freunde* (4 vols., 1881); *Marie Antoinette: Correspondance secrète entre Marie-Thérèse et le comte de Mercy-Argenteau* (3 vols., Paris, 1875), in collaboration with Auguste Geffroy; *Graf Philipp Cobenzl und seine Memoiren* (1885); *Correspondance secrete du comte de Mercy-Argenteau avec l'empereur Joseph II. et Kaunitz* (2 vols., 1889-1891), in collaboration with Jules Flammermont; *Anton Ritter von Schmerling. Episoden aus seinem Leben 1835, 1848-1849* (1895); *Johann Freiherr von Wessenberg, ein österreichischer Staatsmann des 19. Jahrh.* (2 vols., 1898). Arneth also published in 1893 two volumes of early reminiscences under the title of *Aus meinem Leben*.

ARNHEM, or ARNHEIM, the capital of the province of Gelderland, Holland, on the right bank of the Rhine (here crossed by a pontoon bridge), and a junction station 35 m. by rail E.S.E. of Utrecht. Pop. (1900) 57,240. It is connected by tramway with Zutphen and Utrecht, and there is a regular service of steamers to Cologne, Amsterdam, Nijmwegen, Tiel, 's Hertogenbosch and Rotterdam. Arnhem is a gay and fashionable town prettily situated at the foot of the Veluwe hills, and enjoys a special reputation for beauty on account of its wooded and hilly surroundings, which have attracted many wealthy people to its neighbourhood. The Groote Kerk of St Eusebius, built in the third quarter of the 15th century, contains the marble monument to Charles (d. 1538), the last duke of Gelderland of the Egmont dynasty. High up against the wall is an effigy of

the same duke in his armour. The fine lofty tower contains a chime of forty-five bells. The Roman Catholic church of St Walburgis is of earlier date, and a new Roman Catholic church dates from 1894. The town hall was built as a palace by Maarten van Rossum, Duke Charles's general, at the end of the 15th century, and was only converted to its present use in 1830. Its grotesque external ornamentation earned for it the name of Duivelshuis, or devil's house. The provincial government house occupies the site of the former palace of the dukes of Gelderland. Other buildings are the court-house, a public library containing many old works, a theatre, a large concert-hall, a museum of antiquities (as well as a separate collection of Spanish antiquities), a gymnasium, a teachers' and art school, a building (1880) to contain the provincial archives, a hospital (1889) and barracks. On account of its proximity to the fertile Betuwe district and its situation near the confluence of the Rhine and Ysel, the markets and shipping of Arnhem are in a flourishing condition. A wharf for building and repairing iron steamers was constructed in 1889. The manufactures include woollen and cotton goods, paper, earthenware, soap, carriages, furniture and tobacco, which is cultivated in the neighbourhood. Wool-combing and dyeing are also carried on, and there are oil and timber mills.

The environs of Arnhem are much admired. Following either the Zutphen or the Utrecht road, numerous pleasing views of the Rhine valley present themselves, and country houses and villas appear among the woods on every side. At Bronbeek, a short distance east of the town, is a hospital endowed by King William III. for soldiers of the colonial army. Beyond is the popular summer resort of Velp, with the castle of Biljoen built by Charles, duke of Gelderland, in 1530, and the beautiful park of the ancient castle of Rozendaal in the vicinity. The origin of the castle of Rozendaal is unknown. The first account of it is in connexion with a tournament given there by Reinald I., count of Gelderland, in the beginning of the 14th century, and it ever after remained the favourite residence of the counts and

dukes of Gelderland. About the beginning of the 18th century fountains and lanes in the style of those at Versailles were laid out in the park, and soon after the castle itself, of which only the round tower remained (and is still standing), was rebuilt. The park is open to the public, and is famous for the beauty of the beech avenues and fir woods. Beyond this is De Steeg, another popular resort, whence stretches the famous Middachten Allee of beech trees to Dieren. On the Apeldoorn road is Sonsbeek, with a wooded park and small lakes, formerly a private seat and now belonging to the municipality. On the west of Arnhem is another pleasure ground, called the Reeberg, with a casino, and the woods of Heienoord. Close by is the ancient and well-preserved castle of Doornwerth with its own chapel. It was the seat of an independent lordship until 1402, after which time it was held in fief from the dukes of Gelderland. Beyond Doornwerth, at Renkum, is the royal country seat called Oranje-Nassau's Oord, which was bought by the crown in 1881.

History.—Arnhem, called *Arnoldi Villa* in the middle ages, is, according to some, the *Arenacum* of the Romans, and is first mentioned in a document in 893. In 1233 Otto II., count of Gelderland, chose this spot as his residence, conferred municipal rights on the town, and fortified it. At a later period it entered the Hanseatic League. In 1473 it was captured by Charles the Bold of Burgundy. In 1505 it received the right of coining from Philip, son of the emperor Maximilian I. In 1514 Charles of Egmont, duke of Gelderland, took it from the Spaniards; but in 1543 it fell to the emperor Charles V., who made it the seat of the council of Gelderland. It joined the union of Utrecht in 1579, and came finally under the effective government of the states-general in 1585, all the later attacks of the Spaniards being repulsed. In 1586 Sir Philip Sidney died in the town from the effects of his wound received before Zutphen. The French took the town in 1672, but left it dismantled in 1674. It was refortified by the celebrated Dutch general of engineers, Coehoorn, in the beginning of the 18th century. In 1795 it was

again stormed by the French, and in 1813 it was taken from them by the Prussians under Büllow. Gardens and promenades have now taken the place of the old ramparts, the last of which was levelled in 1853.

ARNICA, a genus of plants belonging to the natural order Compositae, and containing 18 species, mostly north-west American. The most important species is *Arnica montana* (mountain tobacco), a perennial herb found in upland meadows in northern and central Europe (but not extending to Britain), and on the mountains of western and central Europe. A closely allied species (*A. angustifolia*), with very narrow leaves, is met with in Arctic Asia and America. The heads of flowers are large, 2 to 2½ in. across, orange-yellow in colour, and borne on the summit of the stem or branches; the outer ray-flowers are an inch in length. The achenes (fruits) are brown and hairy, and are crowned by a tuft of stiffish hairs (pappus). The root-stock of *A. montana* is tough, slender, of a dark brown colour and an inch or two in length. It gives off numerous simple roots from its under side, and shows on its upper side the remains of rosettes of leaves. It yields an essential oil in small quantity, and a resinous matter called arnicin, $C_{12}H_{22}O_2$, a yellow crystalline substance with an acrid taste. The tincture prepared from it is an old remedy which has a popular reputation in the treatment of bruises and sprains. The plant was introduced into English gardens about the middle of the 18th century, but is not often grown; it is a handsome plant for a rockery.

ARNIM, ELISABETH (BETTINA) VON (1785-1859), German authoress, sister of Klemens Brentano, was born at Frankfort-On-Main on the 4th of April 1785. After being educated at a convent school in Fritzlar, she lived for a while with her grandmother, the novelist, Sophie Laroche (1731-1807), at Offenbach, and from 1803 to 1806 with her brother-in-law, Friedrich von Savigny, the famous jurist, at Marburg. In 1807 she made at Weimar the acquaintance of Goethe, for whom she entertained a violent passion, which the poet, although entering into correspondence with her, did not requite, but only regarded as a harmless fancy. Their friendship came to an abrupt end in 1811, owing to "Bettina's" insolent behaviour to Goethe's wife. In this year she married Ludwig Achim von Arnim (*q.v.*), by whom she had seven children. After her husband's death in 1831, her passion for Goethe revived, and in 1835 she published her remarkable book, *Goethes Briefwechsel mit einem Kinde*, which purported to be a correspondence between herself and the poet. Regarded at first as genuine, it was afterwards for many years looked upon as wholly fictitious, until the publication in 1879 of G. von Loeper's *Briefe Goethes an Sophie Laroche und Bettina Brentano, nebst dichterischen Beilagen*, which proved it to be based on authentic material, though treated with the greatest poetical licence. Equally fantastic is her correspondence *Die Gunderode* (1840), with her unhappy friend, the poet, Karoline von Gunderode (1780-1806), who committed suicide, and that with her brother Klemens Brentano, under the title *Klemens Brentanos Fruhlingskranz* (1844). She also published *Dies Buck gehort dem König* (1843), in which she advocated the emancipation of the Jews, and the abolition of capital punishment. Among her other works may be mentioned *Ilius Pamphilius und die Ambrosia* (1848), also a supposititious correspondence. In all her writings she showed real poetical genius, combined with evidence of an unbalanced mind and a mannerism which becomes tiresome. She died at Berlin on the 20th of January 1859.

Part of a design by her for a colossal statue of Goethe, executed in marble by the sculptor Karl Steinhauser (1813-1878), is in the museum at Weimar.

Her collected works (*Samtliche Schriften*) were published in Berlin in 11 vols., 1853. Goethe's *Briefwechsel mit einem Kinde* has been edited by H. Grimm (4th ed., Berlin, 1890). See also C. Alberti, *B. von Arnim* (Leipzig, 1885); Moritz Carriere, *Bettina von Arnim* (Breslau, 1887), and the literature cited under Ludwig von Arnim.

ARNIM, HARRY KARL KURT EDUARD VON, COUNT (1824-1881), German diplomatist, was a member of one of the most numerous and most widely spread families of the Prussian nobility. He was born in Pomerania on the 3rd of October 1824, and brought up by his uncle Heinrich von Arnim, who was Prussian ambassador at Paris and foreign minister from March to June 1848, while Count Arnim-Boytzenburg, whose daughter Harry von Arnim afterwards married, was minister-president. It is noticeable that the uncle was brought before a court of justice and fined for publishing a pamphlet directed against the ministry of Manteuffel. After holding other posts in the diplomatic service Arnim was in 1864 appointed Prussian envoy (and in 1867 envoy of the North German Confederation) at the papal court. In 1869 he proposed that the governments should appoint representatives to be present at the Vatican council, a suggestion which was rejected by Bismarck, and foretold that the promulgation of papal infallibility would bring serious political difficulties. After the recall of the French troops from Rome he attempted unsuccessfully to mediate between the pope and the Italian government. He was appointed in 1871 German

commissioner to arrange the final treaty with France, a task which he carried out with such success that in 1871 he was appointed German envoy at Paris, and in 1872 received his definite appointment as ambassador, a post of the greatest difficulty and responsibility. Differences soon arose between him and Bismarck; he wished to support the monarchical party which was trying to overthrow Thiers, while Bismarck ordered him to stand aloof from all French parties; he did not give that implicit obedience to his instructions which Bismarck required. Bismarck, however, was unable to recall him because of the great influence which he enjoyed at court and the confidence which the emperor placed in him. He was looked upon by the Conservative party, who were trying to overthrow Bismarck, as his successor, and it is said that he was closely connected with the court intrigues against the chancellor. In the beginning of 1874 he was recalled and appointed to the embassy at Constantinople, but this appointment was immediately revoked. A Vienna newspaper published some correspondence on the Vatican council, including confidential despatches of Arnim's, with the object of showing that he had shown greater foresight than Bismarck. It was then found that a considerable number of papers were missing from the Paris embassy, and on the 4th of October Arnim was arrested on the charge of embezzling state papers. This recourse to the criminal law against a man of his rank, who had held one of the most important diplomatic posts, caused great astonishment. His defence was that the papers were not official, and he was acquitted on the charge of embezzlement, but convicted of undue delay in restoring official papers and condemned to three months' imprisonment. On appeal the sentence was increased to nine months. Arnim avoided imprisonment by leaving the country, and in 1875 published anonymously at Zurich a pamphlet entitled "Pro nihilo," in which he attempted to show that the attack on him was caused by Bismarck's personal jealousy. For this he was accused of treason, insult to the emperor, and libelling Bismarck, and in his absence condemned to five years' penal

servitude. From his exile in Austria he published two more pamphlets on the ecclesiastical policy of Prussia, “Der Nunzius kommt!” (Vienna, 1878), and “Quid faciamus nos?” (*ib.* 1879). He made repeated attempts, which were supported by his family, to be allowed to return to Germany in order to take his trial afresh on the charge of treason; his request had just been granted when he died on the 19th of May 1881.

In 1876 Bismarck carried an amendment to the criminal code making it an offence punishable with imprisonment or a fine up to £250 for an official of the foreign office to communicate to others official documents, or for an envoy to act contrary to his instructions. These clauses are commonly spoken of in Germany as the “Arnim paragraphs.”

(J. W. He.)

ARNIM, LUDWIG ACHIM (JOACHIM) VON (1781-1831), German poet and novelist, was born at Berlin on the 26th of January 1781. He studied natural science at Halle and Göttingen, and published one or two essays on scientific subjects; but his bent was from the first towards literature. From the earlier writings of Goethe and Herder he learned to appreciate the beauties of German traditional legends and folk-songs; and, forming a collection of these, published the result (1806-1808), in collaboration with Klemens Brentano (*q.v.*) under the title *Des Knaben Wunderhorn.* From 1810 onward he lived with his wife Bettina, Brentano’s sister, alternately at Berlin and on his estate at Wiepersdorf, near Dahme in Brandenburg, where he died on the 21st of January 1831. Arnim was a prolific and versatile writer, gifted with a sense of humour and a refined

imagination—qualities shown in the best-known of his works, *Des Knaben Wunderhorn*, deficient as this is in the philological accuracy and faithfulness to original sources which would now be expected of such a compilation. In general, however, his writings, full as they are of the exaggerated sentiment and affectations of the romantic school, make but little appeal to modern taste. There are possible exceptions, such as the short stories *Furst Ganzgott und Sanger Halbgott* and *Der tolle Invalide auf dem Fort Ratonneau* and the unfinished romance *Die Kronenwachter* (1817), which promised to develop into one of the finest historical romances of the 19th century. Among Arnim's other works may be mentioned *Hollins Liebesleben* (1802), *Der Wintergarten* (1809), a collection of tales; *Armut, Reichtum Schuld, und Busse der Grafin Dolores* (1810), a novel; *Halle und Jerusalem* (1811), a dramatic romance; and one or two smaller novels, such as *Isabella von Ägypten* (1812).

Arnim's *Samtliche Werke* were edited by his widow and published in Berlin in 1839-1840; second edition in 22 vols., 1853-1856. Selections have been edited by J. Dohmke (1892); M. Koch, *Arnim, Klemens und Bettina Brentano, Gorres* (1893). *Des Knaben Wunderhorn* has been frequently republished, the best edition being that of A. Birlinger and W. Crecelius (2 vols., 1872-1876). See R. Steig, *Achim von Arnim und Klemens Brentano* (1894).

ARNIM-BOYTZENBURG, HANS GEORG VON (1581-1641), German general and diplomatist, was born in 1581 at Boytzenburg in Brandenburg. From 1613 to 1617 he served in the Swedish army under

Gustavus Adolphus, took part in the Russian War, and afterwards fought against the Turks in the service of the king of Poland. In 1626, though a Protestant, he was induced by Wallenstein to join the new imperial army, in which he quickly rose to the rank of field marshal, and won the esteem of his soldiers as well as that of his commander, whose close friend and faithful ally he became. This attachment to Wallenstein, and a spirit of religious toleration, were the leading motives of a strange career of military and political inconstancy. Thus the dismissal of Wallenstein and the perilous condition of German Protestantism after the edict of Restitution combined to induce Arnim to quit the imperial service for that of the elector of Saxony. He had served under Gustavus many years before, and later he had defeated him in the field, when in command of a Polish army; the fortune of war now placed Arnim at the head of the Saxon army which fought by the side of the Swedes at Breitenfeld (1631), and indeed the alliance of these two Protestant powers in the cause of their common religion was largely his work. The reappearances of Wallenstein, however, caused him to hesitate and open negotiations, though he did not attempt to conceal his proceedings from the elector and Gustavus. During the Lützen campaign, Arnim was operating with success at the head of an allied army in Silesia. In the following year he was under the hard necessity of opposing his old friend in the field, but little was done by either; the complicated political situation which followed the death of Gustavus at Lützen led him into a renewal of the private negotiations of the previous year, though he did nothing actually treasonable in his relations with Wallenstein. In 1634 Wallenstein was assassinated, and Arnim began at once more active operations. He won an important victory at Liegnitz in May 1634, but from this time he became more and more estranged from the Swedes. The peace of Prague followed, in which Arnim's part, though considerable, was not all-important (1635). Soon after this event he refused an offer of high command in the French army and retired from active life. From 1637 to 1638 he was imprisoned in

Stockholm, having been seized at Boytzenburg by the Swedes on suspicion of being concerned in various intrigues. He made his escape ultimately, and returned to Saxony. Arnim died suddenly at Dresden in 1641, whilst engaged in raising an army to free German soil from foreign armies of all kinds. (See THIRTY YEARS' WAR.)

See K.G. Helbig, "Wallenstein und Arnim" (1850) and "Der Prager Friede," in Raumer's *Historisches Taschenbuch* (1858); also E.D.M. Kirchner, *Das Schloss Boytzenburg, &c.* (1860) and *Archiv für die sachsische Geschichte*, vol. viii. (1870).

ARNO, ARN or AQUILA (*c.* 750-821), bishop and afterwards archbishop of Salzburg, entered the church at an early age, and after passing some time at Freising became abbot of Elnon, or St Amand as it was afterwards called, where he made the acquaintance of Alcuin. In 785 he was made bishop of Salzburg and in 787 was employed by Tassilo III., duke of the Bavarians, as an envoy to Charlemagne at Rome. He appears to have attracted the notice of the Frankish king, through whose influence in 798 Salzburg was made the seat of an archbishopric; and Arno, as the first holder of this office, became metropolitan of Bavaria and received the pallium from Pope Leo III. The area of his authority was extended to the east by the conquests of Charlemagne over the Avars, and he began to take a prominent part in the government of Bavaria. He acted as one of the *missi dominici*, and spent some time at the court of Charlemagne, where he was known by the assembled scholars as Aquila, and his name appears as one of the signatories to the emperor's will. He established a library at Salzburg,

furthered in other ways the interests of learning, and presided over several synods called to improve the condition of the church in Bavaria. Soon after the death of Charlemagne in 814, Arno appears to have withdrawn from active life, although he retained his archbishopric until his death on the 24th of January 821. Aided by a deacon named Benedict, Arno drew up about 788 a catalogue of lands and proprietary rights belonging to the church in Bavaria, under the title of *Indiculus* or *Congestum Arnonis*. An edition of this work, which is of considerable value to historical students, was published at Münich in 1869 with notes by F. Keinz. Many other works were produced under the protection of Arno, among them a Salzburg consuetudinary, an edition of which appears in *Quellen und Erorterungen zur bayrischen und deutschen Geschichte*, Band vii., edited by L. Rockinger (Münich, 1856). It has been suggested by W. von Giesebrecht that Arno was the author of an early section of *Annales Laurissenses majores*, which deals with the history of the Frankish kings from 741 to 829, and of which an edition appears in *Monumenta Germaniae historica. Scriptores*, Band i. pp. 128-131, edited by G.H. Pertz (Hanover, 1826). If this supposition be correct, Arno was the first extant writer to apply the name *Deutsch* (*theodisca*) to the German language.

ARNO (anc. *Arnus*), a river of Italy which rises from the Monte Falterona, about 25 m. E.N.E. of Florence, 4265 ft. above the sea. It first runs S.S.E. through a beautiful valley, the Casentino; near Arezzo it turns W., and at Montevarchi N.N.W.; 10 m. below it forces its way through the limestone rock at Incisa and 10 m. farther on, at Pontassieve, it is joined by

the Sieve. Thence it runs westward to Florence and through the gorge of Golfolina onwards to Empoli and Pisa, receiving various tributaries in its course, and falls into the sea 7½ m. west of Pisa, after a total course of 155 m. In prehistoric times the river ran straight on along the valley of the Chiana and joined the Tiber near Orvieto; and there was a great lake, the north end of which was at Incisa and the south at the lake of Chiusi. The distance from Pisa to the mouth in the time of Strabo was only 2½ m. The Serchio (anc. *Auser*), which joined the Arno at Pisa in ancient times, now flows into the sea independently. The Arno is navigable for barges as far as Florence; but it is liable to sudden floods, and brings down with it large quantities of earth and stones, so that it requires careful regulation. The most remarkable inundations were those of 1537 and 1740; in the former year the water rose to 8 ft. in the streets of Florence. The valley between Incisa and Arezzo contains accumulations of fossil bones of the deer, elephant, rhinoceros, mastodon, hippopotamus, bear, tiger, &c.

ARNOBIUS (called *Afer*, and sometimes "the Elder"), early Christian writer, was a teacher of rhetoric at Sicca Venerea in proconsular Africa during the reign of Diocletian. His conversion to Christianity is said by Jerome to have been occasioned by a dream; and the same writer adds that the bishop to whom Arnobius applied distrusted his professions, and asked some proof of them, and that the treatise *Adversus Gentes* was composed for this purpose. But this story seems rather improbable; for Arnobius speaks contemptuously of dreams, and besides, his work bears no traces of having been written in a short time, or of having been revised by a Christian

bishop. From internal evidence (bk. iv. 36) the time of composition may be fixed at about A.D. 303. Nothing further is known of the life of Arnobius. He is said to have been the author of a work on rhetoric, which, however, has not been preserved. His great treatise, in seven books, *Adversus Gentes* (or *Nationes*), on account of which he takes rank as a Christian apologist, appears to have been occasioned by a desire to answer the complaint then brought against the Christians, that the prevalent calamities and disasters were due to their impiety and had come upon men since the establishment of their religion. In the first book Arnobius carefully discusses this complaint; he shows that the allegation of greater calamities having come upon men since the Christian era is false; and that, even if it were true, it could by no means be attributed to the Christians. He skilfully contends that Christians who worship the self-existent God cannot justly be called less religious than those who worship subordinate deities, and concludes by vindicating the Godhead of Christ. In the second book Arnobius digresses into a long discussion on the soul, which he does not think is of divine origin, and which he scarcely believes to be immortal. He even says that a belief in the soul's immortality would tend to remove moral restraint, and have a prejudicial effect on human life. In the concluding chapters he answers the objections drawn from the recent origin of Christianity. Books iii., iv. and v. contain a violent attack on the heathen mythology, in which he narrates with powerful sarcasm the scandalous chronicles of the gods, and contrasts with their grossness and immorality the pure and holy worship of the Christian. These books are valuable as a repertory of mythological stories. Books vi. and vii. ably handle the questions of sacrifices and worship of images. The confusion of the final chapter points to some interruption. The work of Arnobius appears to have been written when he was a recent convert, for he does not possess a very extensive knowledge of Scripture. He knows nothing of the Old Testament, and only the life of Christ in the New, while he does not quote directly from the Gospels. He is

also at fault in regard to the Jewish sects. He was much influenced by Lucretius and had read Plato. His statements concerning Greek and Roman mythology are based respectively on the *Protrepticus* of Clement of Alexandria, and on Antistius Labeo, who belonged to the preceding generation and attempted to restore Neoplatonism. There are some pleasing passages in Arnobius, but on the whole he is a tumid and a tedious author.

EDITIONS.—Migne, *Patr. Lat.* iv. 349; A. Reifferscheich in the *Vienna Corpus Script. Eccles. Lat.* (1875).

TRANSLATIONS.—A.H. Bryce and H. Campbell in *Ante-Nicene Fathers*, vi.

LITERATURE.—H.C.G. Moule in *Dict. Chr. Biog.* i.; Herzog-Hauck, *Realencyklopädie*; and G. Kruger, *Early Chr. Lit.* p. 304 (where full bibliographies are given).

ARNOBIUS ("the younger"), Christian priest or bishop in Gaul, flourished about 460. He is the author of a mystical and allegorical commentary on the Psalms, first published by Erasmus in 1522, and by him attributed to the elder Arnobius. It has been frequently reprinted, and in the edition of De la Barre, 1580, is accompanied by some notes on the Gospels by the same author. To him has sometimes been ascribed the anonymous treatise, *Arnobii catholici et Serapionis conflictus de Deo trino et uno ... de gratiae liberi arbitrii concordia*, which was probably written by a follower of Augustine. The opinions of Arnobius, as appears from the commentary, are semi-Pelagian.

ARNOLD, known as "ARNOLD OF BRESCIA" (d. 1155), one of the most ardent adversaries of the temporal power of the popes. He belonged to a family of importance, if not noble, and was born probably at Brescia, in Italy, towards the end of the 11th century. He distinguished himself in his monastic studies, and went to France about 1115. He studied theology in Paris, but there is no proof that he was a pupil of Abelard. Returning to Italy he became a canon regular. His life was rigidly austere, St Bernard calling him "homo neque manducans neque bibens." He at once directed his efforts against the corruption of the clergy, and especially against the temporal ambitions of the high dignitaries of the church. During the schism of Anacletus (1131-1137) the town of Brescia was torn by the struggles between the partisans of Pope Innocent II. and the adherents of the anti-pope, and Arnold gave effect to his abhorrence of the political episcopate by inciting the people to rise against their bishop, and, exiled by Innocent II., went to France. St Bernard accused him of sharing the doctrines of Abelard (see *Ep.* 189, 195), and procured his condemnation by the council of Sens (1140) at the same time as that of the great scholastic. This was perhaps no more than the outcome of the fierce polemical spirit of the abbot of Clairvaux, which led him to include all his adversaries under a single anathema. It seems certain that Arnold professed moral theology in Paris, and several times reprimanded St Bernard, whom he accused of pride and jealousy. St Bernard, as a last resort, begged King Louis VII. to take severe measures against Arnold, who had to leave France and take refuge at Zurich. There he soon became popular, especially with the lay nobility; but, denounced anew by St Bernard to the ecclesiastical authorities, he returned to Italy, and turned his steps towards Rome (1145). It was two years since,

in 1143, the Romans had rejected the temporal power of the pope. The urban nobles had set up a republic, which, under forms ostensibly modelled on antiquity (*e.g.* patriciate, *senatus populusque romanus*, &c.), concealed but clumsily a purely oligarchical government. Pope Eugenius III. and his adherents had been forced after a feeble resistance to resign themselves to exile at Viterbo. Arnold, after returning to Rome, immediately began a campaign of virulent denunciation against the Roman clergy, and, in particular, against the Curia, which he stigmatized as a "house of merchandise and den of thieves." His enemies have attributed to him certain doctrinal heresies, but their accusations do not bear examination. According to Otto of Freising (*Lib. de gestis Friderici*, bk. ii. chap. xx.) the whole of his teaching, outside the preaching of penitence, was summed up in these maxims:—"Clerks who have estates, bishops who hold fiefs, monks who possess property, cannot be saved." His eloquence gained him a hearing and a numerous following, including many laymen, but consisting principally of poor ecclesiastics, who formed around him a party characterized by a rigid morality and not unlike the Lombard Patarenes of the 11th century. But his purely political action was very restricted, and not to be compared with that of a Rienzi or a Savonarola. The Roman revolution availed itself of Arnold's popularity, and of his theories, but was carried out without his aid. His name was associated with this political reform solely because his was the only vigorous personality which stood out from the mass of rebels, and because he was the principal victim of the repression that ensued. On the 15th of July 1148 Eugenius III. anathematized Arnold and his adherents; but when, a short time afterwards, the pope, through the support of the king of Naples and the king of France, succeeded in entering Rome, Arnold remained in the town unmolested, under the protection of the senate. But in 1152 the German king Conrad III., whom the papal party and the Roman republic had in vain begged to intervene, was succeeded by Frederick I. Barbarossa. Frederick, whose authoritative temper was at once offended by

the independent tone of the Arnoldist party, concluded with the pope a treaty of alliance (October 16, 1152) of such a nature that the Arnoldists were at once put in a minority in the Roman government; and when the second successor of Eugenius III., the energetic and austere Adrian IV. (the Englishman, Nicholas Breakspear), placed Rome under an interdict, the senate, already rudely shaken, submitted, and Arnold was forced to fly into Campania (1155). At the request of the pope he was seized by order of the emperor Frederick, then in Italy, and delivered to the prefect of Rome, by whom he was condemned to death. In June 1155 Arnold was hanged, his body burnt, and the ashes were thrown into the Tiber. His death produced but a feeble sensation in Rome, which was already pacified, and passed almost unnoticed in Italy. The adherents of Arnold do not appear actually to have formed, either before or after his death, a heretical sect. It is probable that his adherents became merged in the communities of the Lombard Waldenses, who shared their ideas on the corruption of the clergy. Legend, poetry, drama and politics have from time to time been much occupied with the personality of Arnold of Brescia, and not seldom have distorted it, through the desire to see in him a hero of Italian independence and a modern democrat. He was before everything an ascetic, who denied to the church the right of holding property, and who occupied himself only as an accessory with the political and social consequences of his religious principles.

The bibliography of Arnold of Brescia is very vast and of very unequal value. The following works will be found useful: W. von Giesebrecht, *Arnold van Brescia* (Münich, 1873); G. Gaggia, *Arnaldo da Brescia* (Brescia, 1882); and notices by Vacandard in the *Revue des questions historiques* (Paris, 1884), pp. 52-114, by R. Breyer in the *Histor. Taschenbuch* (Leipzig, 1889), vol. viii. pp. 123-178, and by A. Hausrath in *Neue Heidelberg. Jahrb.* (1891), Band i. pp. 72-144.

(P. A.)

ARNOLD, BENEDICT (1741-1801), American soldier, born in Norwich, Connecticut, on the 14th of January 1741. He was the great-grandson of Benedict Arnold (1615-1678), thrice colonial governor of Rhode Island between 1663 and 1678; and was the fourth in direct descent to bear the name. He received a fair education but was not studious, and his youth was marked by the same waywardness which characterized his whole career. At fifteen he ran away from home and took part in an expedition against the French, but, restless under restraint, he soon deserted and returned home. In 1762 he settled in New Haven, where he became the proprietor of a drug and book shop; and he subsequently engaged successfully in trade with the West Indies. Immediately after the battle of Lexington Arnold led the local militia company, of which he was captain, and additional volunteers to Cambridge, and on the 29th of April 1775 he proposed to the Massachusetts Committee of Safety an expedition against Crown Point and Ticonderoga. After a delay of four days the offer was accepted, and as a colonel of Massachusetts militia he was directed to enlist in the west part of Massachusetts and in the neighbouring colonies the men necessary for the undertaking. He was forestalled, however, by Ethan Allen (*q.v.*), acting on behalf of some members of the Connecticut Assembly. Under him, reluctantly waiving his own claim to command, Arnold served as a volunteer; and soon afterwards, Massachusetts having yielded to Connecticut, and having angered Arnold by sending a committee to make an inquiry into his conduct, he resigned and returned to Cambridge. He was then ordered to co-operate with General Richard Montgomery in the invasion of Canada, which he had been one of the first to suggest to the Continental Congress. Starting with 1100 men from Cambridge on the 17th

of September 1775, he reached Gardiner, Maine, on the 20th, advanced through the Maine woods, and after suffering terrible privations and hardships, his little force, depleted by death and desertion, reached Quebec on the 13th of November. The garrison had been forewarned, and Arnold was compelled to await the coming of Montgomery from Montreal. The combined attack on the 31st of December 1775 failed; Montgomery was killed, and Arnold was severely wounded. Arnold, who had been commissioned a brigadier-general in January 1776, remained in Canada until the following June, being after April in command at Montreal.

Some time after the retreat from Canada, charges of misconduct and dishonesty, growing chiefly out of his seizure from merchants in Montreal of goods for the use of his troops, were brought against him; these charges were tardily investigated by the Board of War, which in a report made on the 23rd of May 1777, and confirmed by Congress, declared that his "character and conduct" had been "cruelly and groundlessly aspersed." Having constructed a flotilla on Lake Champlain, Arnold engaged a greatly superior British fleet near Valcour Island (October 11, 1776), and after inflicting severe loss on the enemy, made his escape under cover of night. Two days later he was overtaken by the British fleet, which however he, with only one war-vessel, and that crippled, delayed long enough to enable his other vessels to make good their escape, fighting with desperate valour and finally running his own ship aground and escaping to Crown Point. The engagement of the 11th was the first between British and American fleets. Arnold's brilliant exploits had drawn attention to him as one of the most promising of the Continental officers, and had won for him the friendship of Washington. Nevertheless, when in February 1777 Congress created five new major-generals, Arnold, although the ranking brigadier, was passed over, partly at least for sectional reasons—Connecticut had already two major-generals—in favour of his juniors. At this time it was only Washington's urgent persuasion that prevented Arnold from leaving the

service. Two months later while he was at New Haven, Governor Tryon's descent on Danbury took place; and Arnold, who took command of the militia after the death of General Wooster, attacked the British with such vigour at Ridgefield (April 27, 1777) that they escaped to their ships with difficulty.

In recognition of this service Arnold was now commissioned major-general (his commission dating from 17th February) but without his former relative rank. After serving in New Jersey with Washington, he joined General Philip Schuyler in the Northern Department, and in August 1777 proceeded up the Mohawk Valley against Colonel St Leger, and raised the siege of Fort Stanwix (or Schuyler). Subsequently, after Gates had superseded Schuyler (August 19), Arnold commanded the American left wing in the first battle of Saratoga (September 19, 1777). His ill-treatment at the hands of General Gates, whose jealousy had been aroused, led to a quarrel which terminated in Arnold being relieved of command. He remained with the army, however, at the urgent request of his brother officers, and although nominally without command served brilliantly in the second battle of Saratoga (October 7, 1777), during which he was seriously wounded. For his services he was thanked by Congress, and received a new commission giving him at last his proper relative rank.

In June 1778 Washington placed him in command of Philadelphia. Here he soon came into conflict with the state authorities, jealous of any outside control. In the social life of Philadelphia, largely dominated by families of Loyalist sympathies, Arnold was the most conspicuous figure; he lived extravagantly, entertained lavishly, and in April 1779 took for his second wife, Margaret Shippen (1760-1804), the daughter of Edward Shippen (1729-1806), a moderate Loyalist, who eventually became reconciled to the new order and was in 1799-1805 chief-justice of the state. Early in February 1779 the executive council of Pennsylvania, presided over by Joseph Reed,

one of his most persistent enemies, presented to Congress eight charges of misconduct against Arnold, none of which was of any great importance. Arnold at once demanded an investigation, and in March a committee of Congress made a report exonerating him; but Reed obtained a reconsideration, and in April 1779 Congress, though throwing out four charges, referred the other four to a court-martial. Despite Arnold's demand for a speedy trial, it was December before the court was convened. It was probably during this period of vexatious delay that Arnold, always sensitive and now incited by a keen sense of injustice, entered into a secret correspondence with Sir Henry Clinton with a view to joining the British service. On the 26th of January 1780 the court, before which Arnold had ably argued his own case, rendered its verdict, practically acquitting him of all intentional wrong, but, apparently in deference to the Pennsylvania authorities, directing Washington to reprimand him for two trivial and very venial offences. Arnold, who had confidently expected absolute acquittal, was inflamed with a burning anger that even Washington's kindly reprimand, couched almost in words of praise, could not subdue.

It was now apparently that he first conceived the plan of betraying some important post to the British. With this in view he sought and obtained from Washington (August 1780) command of West Point, the key to the Hudson River Valley. Arnold's offers now became more explicit, and, in order to perfect the details of the plot, Clinton's adjutant-general, Major John André, met him near Stony Point on the night of the 21st of September. On the 23rd, while returning by land, André with incriminating papers was captured, and the officer to whom he was entrusted unsuspectingly sent information of his capture to Arnold, who was thus enabled to escape to the British lines. Arnold, commissioned a brigadier-general in the British army, received £6315 in compensation for his property losses, and was employed in leading an expedition into Virginia which burned Richmond, and in an attack upon New London (*q.v.*) in September 1781. In December 1781 he

removed to London and was consulted on American affairs by the king and ministry, but could obtain no further employment in the active service. Disappointed at the failure of his plans and embittered by the neglect and scorn which he met in England, he spent the years 1787-1791 at St John, New Brunswick, once more engaging in the West India trade, but in 1791 he returned to London, and after war had broken out between Great Britain and France, was active in fitting out privateers. Gradually sinking into melancholia, worn down by depression, and suffering from a nervous disease, he died at London on the 14th of June 1801.

Arnold had three sons—Benedict, Richard and Henry—by his first wife, and four sons—Edward Shippen, James Robertson, George and William Fitch—by his second wife; five of them, and one grandson, served in the British army. Benedict (1768-1795) was an officer of the artillery and was mortally wounded in the West Indies. Edward Shippen (1780-1813) became lieutenant of the Sixth Bengal Cavalry and later paymaster at Muttra, India. James Robertson (1781-1854) entered the corps of Royal Engineers in 1798, served in the Napoleonic wars, in Egypt and in the West Indies, and rose to the rank of lieutenant-general, was an aide-de-camp to William IV., and was created a knight of the Hanoverian Guelphic order and a knight of the Crescent. George (1787-1828) was a lieutenant-colonel in the Second Bengal Cavalry at the time of his death. William Fitch (1794-1828) became a captain in the Nineteenth Royal Lancers; his son, William Trail (1826-1855) served in the Crimean War as captain of the Fourth Regiment of Foot and was killed during the siege of Sevastopol.

BIBLIOGRAPHY.—Jared Sparks' *Life and Treason of Benedict Arnold* (Boston, 1835), in his "Library of American Biography," is biassed and unfair. The best general account is Isaac Newton Arnold's *Life of Benedict Arnold* (Chicago, 1880), which, while offering no apologies or defence of his treason, lays perhaps too great emphasis on his

provocations. Charles Burr Todd's *The Real Benedict Arnold* (New York, 1903) is a curious attempt to make Arnold's wife wholly responsible for his defection. François de Barbé-Marbois's *Complot d'Arnold et de Sir H. Clinton contre les États-Unis* (Paris, 1816) contains much interesting material, but is inaccurate. Two good accounts of the Canadian Expedition are Justin H. Smith's *Arnold's March from Cambridge to Quebec* (New York, 1903), which contains a reprint of Arnold's journal of the expedition; and John Codman's *Arnold's Expedition to Quebec* (New York, 1901). Arnold's *Letters on the Expedition to Canada* were printed in the Maine Historical Society's *Collections* for 1831 (repr. 1865). See also William Abbatt, *The Crisis of the Revolution* (New York, 1899); *The Northern Invasion of 1780* (Bradford Club Series, No. 6, New York, 1866); "The Treason of Benedict Arnold" (letters of Sir Henry Clinton to Lord George Germaine) in *Pennsylvania Magazine of History and Biography*, vol. xxii. (Philadelphia, 1898); and *Proceedings of a General Court Martial for the Trial of Major-General Arnold* (Philadelphia, 1780; reprinted with introduction and notes, New York, 1865).

ARNOLD, SIR EDWIN (1832-1904), British poet and journalist, was born on the 10th of June 1832, and was educated at the King's school, Rochester; King's College, London; and University College, Oxford, where in 1852 he gained the Newdigate prize for a poem on Belshazzar's feast. On leaving Oxford he became a schoolmaster, and went to India as principal of the government Sanskrit College at Poona, a post which he held during the

mutiny of 1857, when he was able to render services for which he was publicly thanked by Lord Elphinstone in the Bombay council. Returning to England in 1861 he worked as a journalist on the staff of the *Daily Telegraph*, a newspaper with which he continued to be associated for more than forty years. It was he who, on behalf of the proprietors of the *Daily Telegraph* in conjunction with the *New York Herald*, arranged for the journey of H.M. Stanley to Africa to discover the course of the Congo, and Stanley named after him a mountain to the north-east of Albert Edward Nyanza. Arnold must also be credited with the first idea of a great trunk line traversing the entire African continent, for in 1874 he first employed the phrase "a Cape to Cairo railway" subsequently popularized by Cecil Rhodes. It was, however, as a poet that he was best known to his contemporaries. *The Light of Asia* appeared in 1879 and won an immediate success, going through numerous editions both in England and America. It is an Indian epic, dealing with the life and teaching of Buddha, which are expounded with much wealth of local colour and not a little felicity of versification. The poem contains many lines of unquestionable beauty; and its immediate popularity was rather increased than diminished by the twofold criticism to which it was subjected. On the one hand it was held by Oriental scholars to give a false impression of Buddhist doctrine; while, on the other, the suggested analogy between Sakyamuni and Christ offended the taste of some devout Christians. The latter criticism probably suggested to Arnold the idea of attempting a second narrative poem of which the central figure should be the founder of Christianity, as the founder of Buddhism had been that of the first. But though *The Light of the World* (1891), in which this idea took shape, had considerable poetic merit, it lacked the novelty of theme and setting which had given the earlier poem much of its attractiveness; and it failed to repeat the success attained by *The Light of Asia*. Arnold's other principal volumes of poetry were *Indian Song of Songs* (1875), *Pearls of the Faith* (1883), *The Song Celestial* (1885),

With Sadi in the Garden (1888), *Potiphar's Wife* (1892) and *Adzuma* (1893). In his later years Arnold resided for some time in Japan, and his third wife was a Japanese lady. In *Seas and Lands* (1891) and *Japonica* (1892) he gives an interesting study of Japanese life. He received the order of C.S.I. on the occasion of the proclamation of Queen Victoria as empress of India in 1877, and in 1888 was created K.C.I.E. He also possessed decorations conferred by the rulers of Japan, Persia, Turkey and Siam. Sir Edwin Arnold died on the 24th of March 1904.

ARNOLD, GOTTFRIED (1666-1714), German Protestant divine, was born at Annaberg, in Saxony, where his father was a schoolmaster. In 1682 he went to the Gymnasium at Gera, and three years later to the university of Wittenberg. Here he made a special study of theology and history, and afterwards, through the influence of P.J. Spener, "the father of pietism," he became tutor in Quedlinburg. His first work, *Die Erste Liebe zu Christo*, to which in modern times attention was again directed by Leo Tolstoy, appeared in 1696. It went through five editions before 1728, and gained the author much reputation. In the year after its publication he was invited to Giessen as professor of church history. The life and work here, however, proved so distasteful to him that he resigned in 1698, and returned to Quedlinburg. In 1699 he began to publish his largest work, described by Tolstoy (*The Kingdom of God is within You*, chap, iii.) as "remarkable, although little known," *Unparteiische Kirchen- und Ketzerhistorie*, in which he has been thought by some to show more impartiality towards heresy than towards the Church (cp. Otto Pfleiderer, *Development of*

Theology, p. 277). His next work, *Geheimniss der göttlichen Sophia*, published in 1700, seemed to indicate that he had developed a form of mysticism. Soon afterwards, however, his acceptance of a pastorate marked a change, and he produced a number of noteworthy works on practical theology. He was also known as the author of sacred poems. Gottfried Arnold has rightly been classed with the pietistic section of Protestant historians (*Bibliotheca Sacra*, 1850).

See Calwer-Zeller, *Theologisches Handwörterbuch*, and the account of him in Albert Knapp's new edition of *Die erste Liebe zu Christo* (1845).

ARNOLD, MATTHEW (1822-1888), English poet, literary critic and inspector of schools, was born at Laleham, near Staines, on the 24th of December 1822. When it is said that he was the son of the famous Dr Arnold of Rugby, and that Winchester, Rugby and Balliol College, Oxford, contributed their best towards his education, it seems superfluous to add that, in estimating Matthew Arnold and his work, training no less than original endowment has to be considered. A full academic training has its disadvantages as well as its gains. In the individual no less than in the species the history of man's development is the history of the struggle between the impulse to express original personal force and the impulse to make that force bow to the authority of custom. Where in any individual the first of these impulses is stronger than usual, a complete academic training is a gain; but where the second of these impulses is the dominant one, the effect of the academic habit upon the mind at its most sensitive and most

plastic period is apt to be crippling. In regard to Matthew Arnold, it would be a bold critic of his life and his writings who should attempt to say what his work would have been if his training had been different. In his judgments on Goethe, Wordsworth, Byron, Shelley and Hugo, it may be seen how strong was his impulse to bow to authority. On the other hand, in Arnold's ingenious reasoning away the conception of Providence to "a stream of tendency not ourselves which makes for righteousness," we see how strong was his natural impulse for taking original views. The fact that the very air Arnold breathed during the whole of the impressionable period of his life was academic is therefore a very important fact to bear in mind.

In one of his own most charming critical essays he contrasts the poetry of Homer, which consists of "natural thoughts in natural words," with the poetry of Tennyson, which consists of "distilled thoughts in distilled words." "Distilled" is one of the happiest words to be found in poetical criticism, and may be used with equal aptitude in the criticism of life. To most people the waters of life come with all their natural qualities—sweet or bitter—undistilled. Only the ordinary conditions of civilization, common to all, flavoured the waters of life to Shakespeare, to Cervantes, to Burns, to Scott, to Dumas, and those other great creators whose minds were mirrors —broad and clear—for reflecting the rich drama of life around them. To Arnold the waters of life came distilled so carefully that the wonder is that he had any originality left. A member of the upper stratum of that "middle class" which he despised, or pretended to despise—the eldest son of one of the most accomplished as well as one of the most noble-tempered men of his time—Arnold from the moment of his birth drank the finest distilled waters that can be drunk even in these days. Perhaps, on the whole, the surprising thing is how little he suffered thereby. Indeed those who had formed an idea of Arnold's personality from their knowledge of his "culture," and especially those who had been delighted by the fastidious and feminine delicacy of his prose style, used to be quite bewildered when

for the first time they met him at a dinner-table or in a friend's smoking-room. His prose was so self-conscious that what people expected to find in the writer was the Arnold as he was conceived by certain "young lions" of journalism whom he satirized—a somewhat over-cultured *petit-maître*—almost, indeed, a coxcomb of letters. On the other hand, those who had been captured by his poetry expected to find a man whose sensitive organism responded nervously to every uttered word as an aeolian harp answers to the faintest breeze. What they found was a broad-shouldered, manly—almost burly—Englishman with a fine countenance, bronzed by the open air of England, wrinkled apparently by the sun, wind-worn as an English skipper's, open and frank as a fox-hunting squire's—and yet a countenance whose finely chiselled features were as high-bred and as commanding as Wellington's or Sir Charles Napier's. The voice they heard was deep-toned, fearless, rich and frank, and yet modulated to express every *nuance* of thought, every movement of emotion and humour. In his prose essays the humour he showed was of a somewhat thin-lipped kind; in his more important poems he showed none at all. It was here, in this matter of humour, that Arnold's writings were specially misleading as to the personality of the man. Judged from his poems, it was not with a poet like the writer of "The Northern Farmer," or a poet like the writer of "Ned Bratts," that any student of poetry would have dreamed of classing him. Such a student would actually have been more likely to class him with two of his contemporaries between whom and himself there were but few points in common, the "humourless" William Morris and the "humourless" Rossetti. For, singularly enough, between him and them there was this one point of resemblance: while all three were richly endowed with humour, while all three were the very lights of the sets in which they moved, the moment they took pen in hand to write poetry they became sad. It would almost seem as if, like Rossetti, Arnold actually held that poetry was not the proper medium for humour. No wonder, then, if the absence of humour in

his poetry did much to mislead the student of his work as to the real character of the man.

After a year at Winchester, Matthew Arnold entered Rugby school in 1837. He early began to write and print verses. His first publication was a Rugby prize poem, *Alaric at Rome*, in 1840. This was followed in 1843, after he had gone up to Oxford in 1840 as a scholar of Balliol, by his poem *Cromwell*, which won the Newdigate prize. In 1844 he graduated with second-class honours, and in 1845 was elected a fellow of Oriel College, where among his colleagues was A.H. Clough, his friendship with whom is commemorated in that exquisite elegy *Thyrsis*. From 1847 to 1851 he acted as private secretary to Lord Lansdowne; and in the latter year, after acting for a short time as assistant-master at Rugby, he was appointed to an inspectorship of schools, a post which he retained until two years before his death. He married, in June 1851, the daughter of Mr Justice Wightman, Meanwhile, in 1849, appeared *The Strayed Reveller, and other Poems, by A*, a volume which gained a considerable esoteric reputation. In 1852 he published another volume under the same initial, *Empedocles on Etna, and other Poems*. *Empedocles* is as undramatic a poem perhaps as was ever written in dramatic form, but studded with lyrical beauties of a very high order. In 1853 Arnold published a volume of *Poems* under his own name. This consisted partially of poems selected from the two previous volumes. A second series of poems, which contained, however, only two new ones, was published in 1855. So great was the impression made by these in academic circles, that in 1857 Arnold was elected professor of poetry at Oxford, and he held the chair for ten years. In 1858 he published his classical tragedy, *Merope*. Nine years afterwards his *New Poems* (1867) were published. While he held the Oxford professorship he published several series of lectures, which gave him a high place as a scholar and critic. The essays[1] *On Translating Homer: Three Lectures given at Oxford*, published in 1861, supplemented in 1862 by *On Translating Homer: Last*

Words, a fourth lecture given in reply to F.W. Newman's *Homeric Translation in Theory and Practice* (1861), and *On the Study of Celtic Literature*, published in 1867, were full of subtle and brilliant if not of profound criticism. So were the two series of *Essays in Criticism*, the first of which, consisting of articles reprinted from various reviews, appeared in 1865. The essay on "A Persian Passion Play" was added in the editions of 1875; and a second series, edited by Lord Coleridge, appeared in 1888.

Arnold's poetic activity almost ceased after he left the chair of poetry at Oxford. He was several times sent by government to make inquiries into the state of education in France, Germany, Holland and other countries; and his reports, with their thorough-going and searching criticism of continental methods, as contrasted with English methods, showed how conscientiously he had devoted some of his best energies to the work. His fame as a poet and a literary critic has somewhat overshadowed the fact that he was during thirty-five years of his life—from 1851 to 1836—employed in the Education Department as one of H.M. inspectors of schools, while his literary work was achieved in such intervals of leisure as could be spared from the public service. At the time of his appointment the government, by arrangement with the religious bodies, entrusted the inspection of schools connected with the Church of England to clergymen, and agreed also to send Roman Catholic inspectors to schools managed by members of that communion. Other schools—those of the British and Foreign Society, the Wesleyans, and undenominational schools generally—were inspected by laymen, of whom Arnold was one. There were only three or four of these officers at first, and their districts were necessarily large. It is to the experience gained in intercourse with Nonconformist school managers that we may attribute the curiously intimate knowledge of religious sects which furnished the material for some of his keen though good-humoured sarcasms. The Education Act of 1870, which simplified the administrative system, abolished denominational inspection, and thus greatly reduced the

area assigned to a single inspector. Arnold took charge of the district of Westminster, and remained in that office until his resignation, taking also an occasional share in the inspection of training colleges for teachers, and in conferences at the central office. His letters, *passim*, show that some of the routine which devolved upon him was distasteful, and that he was glad to entrust to a skilled assistant much of the duty of individual examination and the making up of schedules and returns. But the influence he exerted on schools, on the department, and on the primary education of the whole country, was indirectly far greater than is generally supposed. His annual reports, of which more than twenty were collected into a volume by his friend and official chief, Sir Francis (afterwards Lord) Sandford, attracted, by reason of their freshness of style and thought, much more of public attention than is usually accorded to blue-book literature; and his high aims, and his sympathetic appreciation of the efforts and difficulties of the teachers, had a remarkable effect in raising the tone of elementary education, and in indicating the way to improvement. In particular, he insisted on the formative elements of school education, on literature and the "humanities," as distinguished from the collection of scraps of information and "useful knowledge"; and he sought to impress all the young teachers with the necessity of broader mental cultivation than was absolutely required to obtain the government certificate. In his reports also he dwelt often and forcibly on the place which the study of the Bible, not the distinctive formularies of the churches, ought to hold in English schools. He urged that besides the religious and moral purposes of Scriptural teaching, it had a literary value of its own, and was the best instrument in the hands even of the elementary teacher for uplifting the soul and refining and enlarging the thoughts of young children.

On three occasions Arnold was asked to assist the government by making special inquiries into the state of education in foreign countries. These duties were especially welcome to him, serving as they did as a relief from

the monotony of school inspection at home, and as opportunities for taking a wider survey of the whole subject of education, and for expressing his views on principles and national aims as well as administrative details. In 1859, as foreign assistant commissioner, he prepared for the duke of Newcastle's commission to inquire into the subject of elementary education a report (printed 1860) which was afterwards reprinted (1861) in a volume entitled *The Popular Education of France, with Notices of that of Holland and Switzerland*. In 1865 he was again employed as assistant-commissioner by the Schools Inquiry Commission under Lord Taunton; and his report on this subject, *On Secondary Education in Foreign Countries* (1866), was subsequently reprinted under the title *Schools and Universities on the Continent* (1868). Twenty years later he was sent by the Education Department to make special inquiries on certain specified points, *e.g.* free education, the status and training of teachers, and compulsory attendance at schools. The result of this investigation appeared as a parliamentary paper, *Special Report on certain points connected with Elementary Education in Germany, Switzerland and France*, in 1886. He also contributed the chapter on "Schools" (1837-1887) to the second volume of Mr Humphry Ward's *Reign of Queen Victoria*. Part of his official writings may be studied in *Reports for Elementary Schools* (1852-1882), edited by Sir F. Sandford in 1889.

All these reports form substantial contributions to the history and literature of education in the Victorian age. They have been quoted often, and have exercised marked influence on subsequent changes and controversies. One great purpose underlies them all. It is to bring home to the English people a conviction that education ought to be a national concern, that it should not be left entirely to local, or private, or irresponsible initiative, that the watchful jealousy so long shown by Liberals, and especially by Nonconformists, in regard to state action was a grave practical mistake, and that in an enlightened democracy, animated by

a progressive spirit and noble and generous ideals, it was the part of wisdom to invoke the collective power of the state to give effect to those ideals. To this theme he constantly recurred in his essays, articles and official reports. "*Porro unum est necessarium*. One thing is needful; organize your secondary education."

In 1883 a pension of £250 was conferred on Arnold in recognition of his literary merits. In the same year he went to the United States on a lecturing tour, and again in 1886, his subjects being "Emerson" and the "Principles and Value of Numbers." The success of these lectures, though they were admirable in matter and form, was marred by the lecturer's lack of experience in delivery. It is sufficient, further, to say that *Culture and Anarchy: an Essay in Political and Social Criticism*, appeared in 1869; *St Paul and Protestantism, with an Introduction on Puritanism and the Church of England* (1870); *Friendship's Garland: being the Conversations, Letters and Opinions of the late Arminius Baron van Thunder-ten-Tronckh* (1871); *Literature and Dogma: an Essay towards a Better Apprehension of the Bible* (1873); *God and the Bible: a Review of Objections to Literature and Dogma* (1875); *Last Essays on Church and Religion* (1877); *Mixed Essays* (1879); *Irish Essays and Others* (1882); *Discourses in America* (1885). Such essays as the first of these, embodying as they did Arnold's views of theological and polemical subjects, attracted much attention at the time of their publication, owing to the state of the intellectual atmosphere at the moment; but it is doubtful, perhaps, whether they will be greatly considered in the near future. Many severe things have been said, and will be said, concerning the inadequacy of poets like Coleridge and Wordsworth when confronting subjects of a theological or philosophical kind. Wordsworth's High Church Pantheism and Coleridge's disquisitions on the Logos seem farther removed from the speculations of to-day than do the dreams of Lucretius. But these two great writers lived before the days of modern science. Arnold, living only a few years later, came at a transition period

when the winds of tyrannous knowledge had blown off the protecting roof that had covered the centuries before, but when time and much labour were needed to build another roof of new materials—a period when it was impossible for the poet to enjoy either the quietism of High Church Pantheism in which Wordsworth had basked, or the sheltering protection of German metaphysics under which Coleridge had preached—a period, nevertheless, when the wonderful revelations of science were still too raw, too cold and hard, to satisfy the yearnings of the poetic soul. Objectionable as Arnold's rationalizing criticism was to contemporary orthodoxy, and questionable as was his equipment in point of theological learning, his spirituality of outlook and ethical purpose were not to be denied. Yet it is not Arnold's views that have become current coin so much as his literary phrases—his craving for "culture" and "sweetness and light," his contempt for "the dissidence of Dissent and the Protestantism of the Protestant religion," his "stream of tendency not ourselves making for righteousness," his classification of "Philistines and barbarians"—and so forth. His death at Liverpool, of heart failure on the 15th of April 1888, was sudden and quite unexpected.

Arnold was a prominent figure in that great galaxy of Victorian poets who were working simultaneously—Tennyson, Browning, Rossetti, William Morris and Swinburne—poets between whom there was at least this connecting link, that the quest of all of them was the old-fashioned poetical quest of the beautiful. Beauty was their watchword, as it had been the watchword of their immediate predecessors—Wordsworth, Coleridge, Keats, Shelley and Byron. That this group of early 19th-century poets might be divided into two—those whose primary quest was physical beauty, and those whose primary quest was moral beauty-is no doubt true. Still, in so far as beauty was their quest they were all akin. And so with the Victorian group to which Arnold belonged. As to the position which he takes among them opinions must necessarily vary. On the whole, his place in the group

will be below all the others. The question as to whether he was primarily a poet or a *prosateur* has been often asked. If we were to try to answer that question here, we should have to examine his poetry in detail—we should have to inquire whether his primary impulse of expression was to seize upon the innate suggestive power of words, or whether his primary impulse was to rely upon the logical power of the sentence. In nobility of temper, in clearness of statement, and especially in descriptive power, he is beyond praise. But intellect, judgment, culture and study of great poets may do much towards enabling a prose-writer to write what must needs be called good poetry. What they cannot enable him to do is to produce those magical effects which poets of the rarer kind can achieve by seizing that mysterious, suggestive power of words which is far beyond all mere statement. Notwithstanding the exquisite work that Arnold has left behind him, some critics have come to the conclusion that his primary impulse in expression was that of the poetically-minded *prosateur* rather than that of the born poet. And this has been said by some who nevertheless deeply admire poems like “The Scholar Gypsy,” “Thyrsis,” “The Forsaken Merman,” “Dover Beach,” “Heine’s Grave,” “Rugby Chapel,” “The Grande Chartreuse,” “Sohrab and Rustum,” “The Sick King in Bokhara,” “Tristram and Iseult,” &c. It would seem that a man may show all the endowments of a poet save one, and that one the most essential—the instinctive mastery over metrical effects.

In all literary expression there are two kinds of emphasis, the emphasis of sound and the emphasis of sense. Indeed the difference between those who have and those who have not the true rhythmic instinct is that, while the former have the innate faculty of making the emphasis of sound and the emphasis of sense meet and strengthen each other, the latter are without that faculty. But so imperfect is the human mind that it can rarely apprehend or grasp simultaneously these two kinds of emphasis. While to the born *prosateur* the emphasis of sense comes first, and refuses to be more than

partially conditioned by the emphasis of sound, to the born poet the emphasis of sound comes first, and sometimes will, even as in the case of Shelley, revolt against the tyranny of the emphasis of sense. Perhaps the very origin of the old quantitative metres was the desire to make these two kinds of emphasis meet in the same syllable. In manipulating their quantitative metrical system the Greeks had facilities for bringing one kind of emphasis into harmony with the other such as are unknown to writers in accentuated metres. This accounts for the measureless superiority of Greek poetry in verbal melody as well as in general harmonic scheme to all the poetry of the modern world. In writers so diverse in many ways as Homer, Æschylus, Sophocles, Pindar, Sappho, the harmony between the emphasis of sound and the emphasis of sense is so complete that each of these kinds of emphasis seems always begetting, yet always born of the other. When in Europe the quantitative measures were superseded by the accentuated measures a reminiscence was naturally and inevitably left behind of the old system; and the result has been, in the English language at least, that no really great line can be written in which the emphasis of accent, the emphasis of quantity and the emphasis of sense do not meet on the same syllable. Whenever this junction does not take place the weaker line, or lines, are always introduced, not for makeshift purposes, but for variety, as in the finest lines of Milton and Wordsworth. Wordsworth no doubt seems to have had a theory that the accent of certain words, such as "without," "within," &c., could be disturbed in an iambic line; but in his best work he does not act upon his theory, and endeavours most successfully to make the emphasis of accent, of quantity and of sense meet. It might not be well for a poem to contain an entire sequence of such perfect lines as

"I thought of Chatterton, the marvellous boy,"

or

"Thy soul was like a star and dwelt apart,"

for then the metricist's art would declare itself too loudly and weaken the imaginative strength of the picture. But such lines should no doubt form the basis of the poem, and weaker lines—lines in which there is no such combination of the three kinds of emphasis—should be sparingly used, and never used for makeshift purposes. Now, neither by instinct nor by critical study was Arnold ever able to apprehend this law of prosody. If he does write a line of the first order, metrically speaking, he seems to do so by accident. Such weak lines as these are constantly occurring—

> "The poet, to whose mighty heart
> Heaven doth a quicker pulse impart,
> Subdues that energy to scan
> Not his own course, but that of man."

Much has been said about what is called the "Greek temper" of Matthew Arnold's muse. A good deal depends upon what it meant by the Hellenic spirit. But if the Greek temper expresses itself, as is generally supposed, in the sweet acceptance and melodious utterance of the beauty of the world as it is, accepting that beauty without inquiring as to what it means and as to whither it goes, it is difficult to see where in Arnold's poetry this temper declares itself. Surely it is not in *Empedocles on Etna*, and surely it is not in *Merope*. If there is a poem of his in which one would expect to find the joyous acceptance of life apart from questionings about the civilization in which the poet finds himself environed (its hopes, its fears, its aspirations and its failures)—such questionings, in short, as were for ever Vexing Arnold's soul—it would be in "The Scholar Gypsy," a poem in which the poet tries to throw himself into the mood of a "Romany Rye." The great attraction of the gypsies to Englishmen of a certain temperament is that they alone seem to feel the joyous acceptance of life which is supposed to be specially Greek. Hence it would have been but reasonable to look, if

anywhere, for the expression of Arnold's Greek temper in a poem which sets out to describe the feelings of the student who, according to Glanville's story, left Oxford to wander over England with the Romanies. But instead of this we got the old fretting about the unsatisfactoriness of modern civilization. Glanville's Oxford student, whose story is glanced at now and again in the poem, flits about in the scenery like a cloud-shadow on the grass; but the way in which Arnold contrives to avoid giving us the faintest idea either dramatic or pictorial of the student about whom he talks so much, and the gypsies with whom the student lived, is one of the most singular feats in poetry. The reflections which come to a young Oxonian lying on the grass and longing to escape life's fitful fever without shuffling off this mortal coil, are, no doubt, beautiful reflections beautifully expressed, but the temper they show is the very opposite of the Greek. To say this is not in the least to disparage Arnold. "A man is more like the age in which he lives," says the Chinese aphorism, "than he is like his own father and mother," and Arnold's polemical writings alone are sufficient to show that the waters of life he drank were from fountains distilled, seven times distilled, at the topmost slope of 19th-century civilization. Mr George Meredith's "Old Chartist" exhibits far more of the temper of acceptance than does any poem by Matthew Arnold.

His most famous critical dictum is that poetry is a "criticism of life." What he seems to have meant is that poetry is the crowning fruit of a criticism of life; that just as the poet's metrical effects are and must be the result of a thousand semiconscious generalizations upon the laws of cause and effect in metric art, so the beautiful things he says about life and the beautiful pictures he paints of life are the result of his generalizations upon life as he passes through it, and consequently that the value of his poetry consists in the beauty and the truth of his generalizations. But this is saying no more than is said in the line—

“Rien n’est beau que le vrai; le vrai seul est aimable”—

or in the still more famous lines—

“‘Beauty is truth, truth beauty,’—that is all
Ye know on earth, and all ye need to know.”

To suppose that Arnold confounded the poet with the writer of *pensées* would be absurd. Yet having decided that poetry consists of generalizations on human life, in reading poetry he kept on the watch for those generalizations, and at last seemed to think that the less and not the more they are hidden behind the dramatic action, and the more unmistakably they are intruded as generalizations, the better. For instance, in one of his essays he quotes those lines from the “Chanson de Roland” of Turoldus, where Roland, mortally wounded, lays himself down under a pine-tree with his face turned towards Spain and the enemy, and begins to “call many things to remembrance; all the lands which his valour conquered, and pleasant France, and the men of his lineage, and Charlemagne, his liege lord, who nourished him”—

“De plusurs choses à remembrer li prist,
De tames teres cume li bers cunquist,
De dulce France, des humes de sun ligu,
De Carlemagne sun seignor ki l’nurrit.”

“That,” says Arnold, “is primitive work, I repeat, with an undeniable poetic quality of its own. It deserves such praise, and such praise is sufficient for it.” Then he contrasts it with a famous passage in Homer—that same passage which is quoted in the article POETRY, for the very

opposite purpose to that of Arnold's, quoted indeed to show how the epic poet, leaving the dramatic action to act as chorus, weakens the ἀπάτη of the picture—the passage in the *Iliad* (iii 243-244) where the poet, after Helen's pathetic mention of her brother's comments on the causes of their absence, "criticizes life" and generalizes upon the impotence of human intelligence, the impotence even of human love, to pierce the darkness in which the web of human fate is woven. He appends Dr Hawtrey's translation:—

Ὣς φάτο τοὺς δ᾽ ἤδη κάτεχεν φυσίζοος αἶα
ἐν Λακεδαίμονι αὖθι, φίλῃ ἐν πατρίδι γαίῃ.

"So said she; they long since in Earth's soft arms were reposing
There, in their own dear land, their fatherland, Lacedaemon."

"We are here," says Arnold, "in another world, another order of poetry altogether; here is rightly due such supreme praise as that which M. Vitel gives to the *Chanson de Roland*. If our words are to have any meaning, if our judgments are to have any solidity, we must not heap that supreme praise upon poetry of an order immeasurably inferior." He does not see that the two passages cannot properly be compared at all. In the one case the poet gives us a dramatic picture; in the other; a comment on a dramatic picture.

Perhaps, indeed, the place Arnold held and still holds as a critic is due more to his exquisite felicity in expressing his views than to the penetration of his criticism. Nothing can exceed the easy grace of his prose at the best. It is conversational and yet absolutely exact in the structure of the sentences; and in spite of every vagary, his distinguishing note is urbanity. Keen-edged as his satire could be, his writing for the most part is as urbane

as Addison's own. His influence on contemporary criticism and contemporary ideals was considerable, and generally wholesome. His insistence on the necessity of looking at "the thing in itself," and the need for acquainting oneself with "the best that has been thought and said in the world," gave a new stimulus alike to originality and industry in criticism; and in his own selection of subjects—such as *Joubert*, or the *de Guérins*—he opened a new world to a larger class of the better sort of readers, exercising in this respect an awakening influence in his own time akin to that of Walter Pater a few years afterwards. The comparison with Pater might indeed be pressed further, and yet too far. Both were essentially products of Oxford. But Arnold, whose description of that "home of lost causes, and forsaken beliefs, and unpopular names, and impossible loyalties," is in itself almost a poem, had a classical austerity in his style that savoured more intimately of Oxford tradition, and an ethical earnestness even in his most flippant moments which kept him notably aloof from the more sensuous school of aesthetics.

The first collected edition of Arnold's poems was published in 1869 in two volumes, the first consisting of *Narrative and Elegiac Poems*, and the second of *Dramatic and Lyric Poems*. Other editions appeared in 1877, 1881; a library edition (3 vols., 1885); a one-volume reprint of the poems printed in the library edition with one or two additions (1890). Publications by Matthew Arnold not mentioned in the foregoing article include: *England and the Italian Question* (1859), a pamphlet; *A French Eton; or, Middle Class Education and the State* (1864); *Higher Schools and Universities in Germany* (1874), a partial reprint from *Schools and Universities on the Continent* (1868); *A Bible Reading for Schools; The Great Prophecy of Israel's Restoration*, an arrangement of *Isaiah*, chs. xl.-lxvi. (1872), republished with additions and varying titles in 1875 and 1883; an edition of the *Six Chief Lives from Johnson's Lives of the Poets* (1878); editions of the *Poems of Wordsworth* (1879), and the *Poetry of Byron* (1881), for the Golden Treasury Series, with prefatory essays reprinted in the second series of *Essays in Criticism*; an edition of *Letters, Speeches and Tracts on Irish Affairs by Edmund Burke* (1881); and many contributions to periodical literature. *The Letters of Matthew Arnold* (1848-1888) were collected and arranged by George W.E. Russell in 1895, reprinted 1901. *Matthew Arnold's Note Books, with a Preface by the Hon. Mrs Wodehouse*, appeared in 1902. A complete and uniform edition of *The Works of Matthew Arnold* (15 vols., 1904-1905) includes the letters as edited by Mr Russell. Vol. iii. contains a complete bibliography of his works, many of the early editions of which are very valuable, by Mr T.B. Smart, who published a separate bibliography in 1892. A valuable note on the rather complicated subject of Arnold's bibliography is given by Mr H. Buxton Forman in Arnold's *Poems, Narrative, Elegiac and Lyric* (Temple Classics, 1900).

It was Arnold's expressed desire that his biography should not be written, and before his letters were published they underwent considerable editing at the hands of his family. There are, however, monographs on Matthew Arnold (1899) in *Modern English Writers* by Prof. Saintsbury, and by Mr H.W. Paul (1902), in the English Men of Letters Series. These two works are supplemented by Mr G.W.E. Russell, who, as the editor of Arnold's letters, is in a sense the official biographer, in *Matthew Arnold* (1904, Literary Lives Series). There are also studies of Arnold in Mr J.M. Robertson's *Modern Humanists* (1891), and in W.H. Hudson's *Studies in Interpretation* (1896), in Sir J.G. Fitch's *Thomas and Matthew Arnold* (1897), and a review of some of the works above mentioned in the *Quarterly* for January 1905 by T.H. Warren.

(T. W.-D.; J. G. F.)

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1 These essays were edited in 1905 with an introduction by W.H.D. Rouse.

ARNOLD, SAMUEL (1740-1802), English composer, was born at London on the both of August 1740. He received a thorough musical education at the Chapel Royal, and when little more than twenty years of age was appointed composer at Covent Garden theatre. Here, in 1765, he produced his popular opera, *The Maid of the Mill*, many of the songs in which were selected from the works of Italian composers. In 1776 he transferred his services to the Haymarket theatre. In 1783 he was made composer to George III. Between 1765 and 1802 he wrote as many as forty-three operas, after-pieces and pantomimes, of which the best were *The Maid*

of the Mill, *Rosamond*, *Inkle and Yarico*, *The Battle of Hexham*, *The Mountaineers*. His oratorios included *The Cure of Saul* (1767), *Abimelech* (1768), *The Resurrection* (1773), *The Prodigal Son* (1777) and *Elisha* (1795). In 1783 he became organist to the Chapel Royal. In 1786 he began an edition of Handel's works, which extended to 40 volumes, but was never completed. In 1793 he became organist of Westminster Abbey, where he was buried after his death on the 22nd of October 1802. Arnold is chiefly remembered now for the publication of his *Cathedral Music, being a collection in score of the most valuable and useful compositions for that service by the several English masters of the last 200 years* (1790).

ARNOLD, THOMAS (1705-1842), English clergyman and headmaster of Rugby school, was born at West Cowes, in the Isle of Wight, on the 13th of June 1795. He was the son of William and Martha Arnold, the former of whom occupied the situation of collector of customs at Cowes. His father died suddenly of spasm in the heart in 1801, and his early education was confided by his mother to her sister, Miss Delafield. From her tuition he passed to that of Dr Griffiths, at Warminster, in Wiltshire, in 1803; and in 1807 he was removed to Winchester, where he remained until 1811, having entered as a commoner, and afterwards become a scholar of the college. In after life he retained a lively feeling of interest in Winchester school, and remembered with admiration and profit the regulative tact of Dr Goddard and the preceptorial ability of Dr Gabell, who were successively head-masters during his stay there.

From Winchester he removed to Oxford in 1811, where he became a scholar at Corpus Christi College; in 1815 he was elected fellow of Oriel College, and there he continued to reside until 1819. This interval was diligently devoted to the pursuit of classical and historical studies, to preparing himself for ordination, and to searching investigations, under the stimulus of continued discussion with a band of talented and congenial associates, of the profoundest questions in theology, ecclesiastical polity and social philosophy. The authors he most carefully studied at this period were Thucydides and Aristotle, and for their writings he formed an attachment which remained to the close of his life, and exerted a powerful influence upon his mode of thought and opinions, as well as upon his literary occupations in subsequent years. Herodotus also came in for a considerable share of his regard, but more, apparently, for recreation than for work. Accustomed freely and fearlessly to investigate whatever came before him, and swayed by a scrupulous dread of insincerity, he was doomed to long and anxious hesitation concerning some of the fundamental points of theology before arriving at a firm conviction of the truth of Christianity. Once satisfied, however, his faith remained clear and firm; and thenceforward his life became that of a supremely *religious* man.

To the name of Christ he was prepared to "surrender his whole soul," and to render before it "obedience, reverence without measure, intense humility, most unreserved adoration" (*Serm. ns.* vol. iv. p. 210). He did not often talk about religion; he had not much of the accredited phraseology of piety even when he discoursed on spiritual topics; but more than most men he was directed by religious principle and feeling in all his conduct. He left Oxford in 1819, and settled at Laleham, near Staines, where he took pupils for the university. His spare time was devoted to the prosecution of studies in philology and history, more particularly to the study of Thucydides, and of the new light which had been cast upon Roman history and upon historical method in general by the researches of Niebuhr. He was also occasionally

engaged in preaching, and it was whilst here that he published the first volume of his sermons. Shortly after he settled at Laleham, he married Mary, youngest daughter of the Rev. John Penrose, rector of Fledborough, Nottinghamshire. After nine years spent at Laleham he was induced to offer himself as a candidate for the vacant head-mastership of Rugby; and though he entered somewhat late upon the contest, and though none of the electors was personally known to him, he was elected in December 1827. In June 1828 he received priest's orders; in April end November of the same year he took his degrees of B.D. and D.D., and in August entered on his new office.

In one of the testimonials which accompanied his application to the trustees of Rugby, the writer stated it as his conviction that "if Mr Arnold were elected, he would change the face of education all through the public schools of England." This somewhat hazardous pledge was nobly redeemed. Under Arnold's superintendence the school became not merely a place where a certain amount of classical or general learning was to be obtained, but a sphere of intellectual, moral and religious discipline, where healthy characters were formed, and men were trained for the duties, and struggles and responsibilities of life. His energies were chiefly devoted to the business of the school; but he found time also for much literary work, as well as for an extensive correspondence. Five volumes of sermons, an edition of Thucydides, with English notes and dissertations, a History of Rome in three vols. 8vo, beside numerous articles in reviews, journals, newspapers and encyclopædias, are extant to attest the untiring activity of his mind, and his patient diligence during this period. His interest also in public matters was incessant, especially ecclesiastical questions, and such as bore upon the social welfare and moral improvement of the masses.

In 1841, after fourteen years at Rugby, Dr Arnold was appointed by Lord Melbourne, then prime minister, to the chair of modern history at Oxford. On the 2nd of December 1841 he delivered his inaugural lecture. Seven

other lectures were delivered during the first three weeks of the Lent term of 1842. When the midsummer vacation arrived, he was preparing to set out with his family to Fox How in Westmoreland, where he had purchased some property and built a house. But he was suddenly attacked by angina pectoris, and died on Sunday, the 12th of June 1842. His remains were interred on the following Friday in the chancel of Rugby chapel, immediately under the communion table.

The great peculiarity and charm of Dr Arnold's nature seemed to lie in the supremacy of the moral and the spiritual element over his whole being. He was not a notable scholar, and he had not much of what is usually called tact in his dealings either with the juvenile or the adult mind. What gave him his power, and secured for him so deeply the respect and veneration of his pupils and acquaintances, was the intensely religious character of his whole life. He seemed ever to act from a severe and lofty estimate of duty. To be just, honest and truthful, he ever held to be the first aim of his being.

His *Life* was written by Dean Stanley (1845).

ARNOTT, NEIL (1788-1874), Scottish physician, was born at Arbroath on the 15th of May 1788. He studied medicine first at Aberdeen, and subsequently in London under Sir Everard Home (1756-1832), through whom he obtained, while yet in his nineteenth year, the appointment of full surgeon to an East Indiaman. After making two voyages to China he settled in 1811 to practise in London, and speedily acquired high reputation in his profession. Within a few years he was made physician to the French and

Spanish embassies, and in 1837 he became a physician extraordinary to the queen. From his earliest youth Arnott had an intense love of natural philosophy, and to this was added an inventiveness which served him in good stead in his profession and yielded the "Arnott water-bed," the "Arnott ventilator," the "Arnott stove," &c. He was the author of several works bearing on physical science or its applications, the most important being his *Elements of Physics* (1827), which went through six editions in his lifetime. In 1838 he published a treatise on *Warming and Ventilating*, and, in 1855, one on the *Smokeless Fireplace*. He was a strong advocate of scientific, as opposed to purely classical, education; and he manifested his interest in natural philosophy by the gift of £2000 to each of the four universities of Scotland and to the university of London, to promote its study in the experimental and practical form. He died in London on the 2nd of March 1874.

ARNOULD-PLESSY, JEANNE SYLVANIE (1819-1897), French actress, was born in Metz on the 7th of September 1819, the daughter of a local actor named Plessy. She was a pupil of Samson at the Conservatoire in 1829, and made her *début* as Emma at the Comédie Française in 1834 in Alexandre Duval's *La Fille d'honneur*. She had an immense success, and Mlle Mars, to whom the public already compared her, took her up. Until 1845 she had prominent parts in all the plays, new and old, at the Théâtre Français, when suddenly at the height of her success, she left Paris and went to London, marrying the dramatic author, J.F. Arnould (d. 1854), a man much older than herself. The Comédie Française, after having tried in vain

to bring her back, brought a suit against her, and obtained heavy damages. In the meantime Madame Arnould-Plessy accepted an engagement at the French theatre at St Petersburg, where she played for nine years. In 1855 she returned to Paris and was re-admitted to the Comédie Française, as *pensionnaire* with an engagement for eight years. This second part of her career was even more brilliant than the first. She revived some of her old rôles, but began to abandon the *jeunes premières* for the "lead," in which she had a success unequalled since the retirement of Mlle Mars. Her later triumphs were especially associated with new plays by Émile Augier, *Le Fils de Giboyer* and *Maître Guerin*. Her last appearance was in Edouard Cadol's *La Grand-maman*; she retired in 1876, and died in 1897.

ARNSBERG, a town of Germany, in the Prussian province of Westphalia, romantically situated on an eminence almost surrounded by the river Ruhr, 44 m. S.E. of Münster and 58 m. E.N.E. of Düsseldorf by rail. Pop. (1900) 8490. It is the seat of the provincial authorities, and has three churches, a court of appeal, a Roman Catholic gymnasium, which was formerly the Benedictine abbey of Weddinghausen, a library, a normal school and a chamber of commerce. Weaving, brewing and distilling are carried on, and there are manufactories of white lead, shot and paper, works for the production of railway plant, and saw-mills. Near the town are the ruins of the castle of the counts of Arnsberg, the last of whom, Gottfried, sold his countship, in 1368, to the archbishop of Cologne. The countship was incorporated by the archbishops in their duchy of Westphalia, which in 1802 was assigned to Hesse-Darmstadt and in 1815 to Prussia. The town,

which had received its first charter in 1237 and later joined the Hanseatic League, became the capital of the duchy.

ARNSTADT, a town in the principality of Schwarzburg-Sondershausen, Germany, on the river Gera, 11 m. S. of Erfurt, with which it is connected by rail. Pop. (1900) 14,413. There are five churches, four Protestant and one Catholic. The Evangelical Liebfrauenkirche, a Romanesque building (mainly 12th-century), has two octagonal towers and a 10th-century porch. The palace contains collections of pictures and porcelain, and attached to it is a magnificent tower, all that remains of the castle built in 1560. The town hall dates from 1561. The industries of Arnstadt include iron and other metal founding, the manufacture of leather, cloth, tobacco, weighing-machines, paper, playing-cards, chairs, gloves, shoes, iron safes, and beer, and market-gardening and trade in grain and wood are carried on. There are copper-mines in the neighbourhood, as well as tepid saline springs, the waters of which are used for bathing, and are much frequented in summer. Arnstadt dates back to the 8th century. It was bought in 1306 by the counts of Schwarzburg, who lived here till 1716.

ARNSWALDE, a town of Germany, in the kingdom of Prussia, in a marshy district between four lakes, 20 m. S.W. of Stargard and on the main

line between that place and Posen. Besides the Gothic church there are no noteworthy public buildings. Its industries include iron founding, machinery, and manufactures of cloth, matches and starch. Pop. (1900) 8665.

ARNULF (*c.* 850-899), Roman emperor, illegitimate son of Carloman, king of Bavaria and Italy, was made margrave of Carinthia about 876, and on his father's death in 880 his dignity and possessions were confirmed by the new king of the east Franks, Louis III. The failure of legitimate male issue of the later Carolingians gave Arnulf a more important position than otherwise he would have occupied; but he did homage to the emperor Charles the Fat in 882, and spent the next few years in constant warfare with the Slavs and the Northmen. In 887, however, Arnulf identified himself with the disgust felt by the Bavarians and others at the incapacity of Charles the Fat. Gathering a large army, he marched to Tribur; Charles abdicated and the Germans recognized Arnulf as their king, a proceeding which L. von Ranke describes as "the first independent action of the German secular world." Arnulf's real authority did not extend far beyond the confines of Bavaria, and he contented himself with a nominal recognition of his supremacy by the kings who sprang up in various parts of the Empire. Having made peace with the Moravians, he gained a great and splendid victory over the Northmen near Louvain in October 891, and in spite of some opposition succeeded in establishing his illegitimate son, Zwentibold, as king of the district afterwards called Lorraine. Invited by Pope Formosus to deliver him from the power of Guido III., duke of

Spoleto, who had been crowned emperor, Arnulf went to Italy in 894, but after storming Bergamo and receiving the homage of some of the nobles at Pavia, he was compelled by desertions from his army to return. The restoration of peace with the Moravians and the death of Guido prepared the way for a more successful expedition in 895 when Rome was stormed by his troops; and Arnulf was crowned emperor by Formosus in February 896. He then set out to establish his authority in Spoleto, but on the way was seized with paralysis. He returned to Bavaria, where he died on the 8th of December 899, and was buried at Regensburg. He left, by his wife Ota, a son Louis surnamed the Child. Arnulf possessed the qualities of a soldier, and was a loyal supporter of the church.

See "Annales Fuldenses" in the *Monumenta Germaniae historica. Scriptores*, Band i. (Hanover and Berlin, 1826); E. Dümmler, *Geschichte des ostfränkischen Reichs* (Leipzig, 1887-1888); M.J.L. de Gagern, *Arnulfi imperatoris vita* (Bonn, 1837); E. Dümmler, *De Arnulfo Francorum rege* (Berlin, 1852); W.B. Wenck, *Die Erhebung Arnulfs und der Zerfall des karolingischen Reiches* (Leipzig, 1852); O. Dietrich, *Beitrâge zur Geschichte Arnolfs von Karnthen und Ludwigs des Kindes* (Berlin, 1890); E. Mühlbacher, *Die Regesten des Kaiserreichs unter den Karolingern* (Innsbruck, 1881).

AROIDEAE (Arum family), a large and wide-spread botanical order of Monocotyledons containing about 1000 species in 105 genera. It is generally distributed in temperate and tropical regions, but especially developed in warm countries. The common British representative of the

order, *Arum maculatum* (cuckoo-pint, lords and ladies, or wake robin), gives a meagre idea of its development. The plants are generally herbaceous, often, however, reaching a gigantic size, but are sometimes shrubby, as in *Pothos*, a genus of shrubby climbing plants, chiefly Malayan. *Monstera* is a tropical American genus of climbing shrubs, with large often much-perforated leaves; the fruiting spikes of a Mexican species, *M. deliciosa*, are eaten. The roots of the climbing species are of interest in their adaptation to the mode of life of the plant. For instance, some species of *Philodendron* have a growth like that of ivy, with feeding roots penetrating the soil and clasping roots which fix the plant to its support. In other species of the genus the seed germinates on a branch, and the seedling produces clasping roots, and roots which grow downwards hanging like stout cords, and ultimately reaching the ground. The leaves, which show great variety in size and form, are generally broad and net-veined, but in sweet-flag (*Acorus Calamus*) are long and narrow with parallel veins. In *Arum* the blade is simple, as also in the so-called arum-lily (*Richardia*), a South African species common in Britain as a greenhouse plant, and in *Caladium*, a tropical South American genus, and *Alocasia* (tropical Asia), species of which are favourite warm-greenhouse plants on account of their variegated leaves. In other genera the leaves are much divided and sometimes very large; those of *Dracontium* (tropical America) may be 15 ft. high, with a long stem-like stalk and a much-branched spreading blade. The East Indian genus *Amorphophallus* has a similar habit. A good series of tropical aroids is to be seen in the aroid house at Kew. The so-called water cabbage (*Pistia Stratiotes*) is a floating plant widely distributed in the tropics, and consisting of rosettes of broadish leaves several inches across and a tuft of roots hanging in the water.

Arum maculatum, Cuckoo-pint

1. Leaves and inflorescence.
2. Underground root-stock.
4. Spike of fruits. Showing in succession (from below) female flowers, male

3. Lower part of spathe cut open. flowers, and sterile flowers forming a ring of hairs borne on the spadix.

The small flowers are densely crowded on thick fleshy spikes, which are associated with, and often more or less enveloped by, a large leaf (bract), the so-called spathe, which, as in cuckoo-pint, where it is green in colour, *Richardia*, where it is white, creamy or yellow, *Anthurium*, where it is a brilliant scarlet, is often the most striking feature of the plant. The details of the structure of the flower show a wide variation; the flowers are often extremely simple, sometimes as in *Arum*, reduced to a single stamen or pistil. The fruit is a berry—the scarlet berries of the cuckoo-pint are familiar objects in the hedges in late summer. The plants generally contain an acrid poisonous juice. The underground stems (rhizomes or tubers) are rich in starch; from that of *Arum maculatum* Portland arrowroot was formerly extensively prepared by pounding with water and then straining; the starch was deposited from the strained liquid.

The order is represented in Britain by *Arum maculatum*, a low herbaceous plant common in woods and hedgerows in England, but probably not wild in Scotland. It grows from a whitish root-stock which sends up in the spring a few long-stalked, arrow-shaped leaves of a polished green, often marked with dark blotches. These are followed by the inflorescence, a fleshy spadix bearing in the lower part numerous closely crowded simple unisexual flowers and continued above into a purplish or yellowish appendage; the spadix is enveloped by a leafy spathe, constricted in the lower part to form a chamber, in which are the flowers. The mouth of this chamber is protected by a ring of hairs pointing downwards, which allow the entrance but prevent the escape of small flies; after fertilization of the pistils the hairs wither. The insects visit the plant in large numbers, attracted by the foetid smell, and act as carriers of the pollen from one spathe to another. As the fruit ripens the spathe withers, and the brilliant red berries are exposed.

The sweet-flag *Acorus Calamus* (*q.v.*), which occurs apparently wild in England in ditches, ponds, &c., is supposed to have been introduced.

AROLSEN, a town of Germany, capital of the principality of Waldeck, 25 m. N.W. of Cassel, with which it is connected by rail via Warburg. Pop. 3000. It lies in a pleasant undulating country at an elevation of 900 ft. above the sea. The Evangelical parish church contains some fine statues by Christian Rauch, and the palace (built 1710-1720), in addition to a valuable library of 30,000 vols., a collection of coins and pictures, among the latter several by Angelica Kauffmann. Arolsen is the birthplace of the sculptor C. Rauch and of the painters Wilhelm and Friedrich Kaulbach.

ARONA, a town of Piedmont, Italy, in the province of Novara, on the W. bank of Lake Maggiore, 3 m. from its S. extremity, 23 m. N. of Novara, and 42 m. N.W. of Milan by rail. Pop. (1901) 4700. It is a railway centre of some importance on the Simplon line, and is also the southern terminus of the steamers which ply on Lake Maggiore. The church of S. Maria contains a fine altar-piece by Gaudenzio Ferrari. On a hill to the north of the town stands a colossal bronze statue of S. Carlo Borromeo (born here in 1538), erected in 1697. The pedestal, of red granite, is 42 ft. high, and the statue 70 ft. high; the latter is hollow, and can be ascended from within.

ARPEGGIO (from Ital. *arpeggiare*, to play upon the harp), in music, the notes of a chord, played in rapid succession as on a harp, and not together.

ARPI (Gr. Ἀργύριππα), an ancient city of Apulia, 20 m. W. of the sea coast, and 5 m. N. of the modern Foggia. The legend attributes its foundation to Diomedes, and the figure of a horse, which appears on its coins, shows the importance of horse-breeding in early times in the district. Its territory extended to the sea, and Strabo says that from the extent of the city walls one could gather that it had once been one of the greatest cities of Italy. As a protection against the Samnites Arpi became an ally of Rome, and remained faithful until after the battle of Cannae, but Fabius captured it in 213 B.C., and it never recovered its former importance. It lay on a by-road from Luceria to Sipontum. No Roman inscriptions have, indeed, been found here, and remains of antiquity are scanty. Foggia is its medieval representative.

(T. As.)

ARPINO (anc. *Arpinum*), a town of Campania, Italy, in the province of Caserta, 1475 ft. above sea-level; 12 m. by rail N.W. of Roccasecca, a station on the railway from Naples to Rome. Pop. (1901) 10,607. Arpino occupies the lower part of the site of the ancient Volscian town of Arpinum, which was finally taken from the Samnites by the Romans in 305 B.C. It became a *civitas sine suffragio*, but received full privileges (*civitas cum suffragio*) in 188 B.C. with Formiae and Fundi; it was governed as a *praefectura* until the Social War, and then became a *municipium*. The ancient polygonal walls, which are still finely preserved, are among the best in Italy. They are built of blocks of pudding-stone, originally well jointed, but now much weathered. They stand free in places to a height of 11 ft., and are about 7 ft. wide at the top. A single line of wall, with medieval round towers at intervals, runs on the north side from the present town to Civitavecchia (2055 ft.), on the site of the ancient citadel. Here is the Porta dell' Arco, a gate of the old wall, with an aperture 15 ft. high, formed by the gradual inclination of the two sides towards one another. Below Arpino, in the valley of the Liris, between the two arms of its tributary the Fibrenus, and ¾ m. north of Isola del Liri, lies the church of S. Domenico, which marks the site of the villa in which Cicero was born and frequently resided. Near it is an ancient bridge, of a road which crossed the Liris to Cereatae (modern Casamari). The painter Giuseppe Cesari (1560-1640), more often known as the Cavaliere d' Arpino, was also born here.

See O.E. Schmidt, *Arpinum, eine topographisch-historische Skizze* (Meissen, 1900).

(T. As.)

ARQUÀ PETRARCA, a village of Venetia, Italy, in the province of Padua, 3 m. to the S.W. of Battaglia. Pop. (1901) 1573. It is chiefly famous as the place where Petrarch lived his last few years and died in 1374. His house still exists, and his tomb, a sarcophagus supported by four short columns of red marble, stands in front of the church. Near Arquà, on the banks of the small Lago della Costa, is the site of a prehistoric lake village, excavations in which have produced interesting results.

See A. Moschetti and F. Cordenone in *Bollettino del Museo Civico di Padova*, iv. (1901), 102 seq.

ARQUEBUS (also called harquebus, hackbut, &c.), a firearm of the 16th century, the immediate predecessor of the musket. The word itself is certainly to be derived from the German Hakenbühse (mod. Hakenbüchse, cf. Eng. *hackbut* and *hackbush*), "hook gun." The "hook" is often supposed to refer to the bent shape of the butt, which differentiated it from the straight-stocked hand gun, but it has also been suggested that the original arquebus had a metal hook near the muzzle, which was used to grip the wall (or other fixed object) so as to steady the aim and take up the force of recoil, that from this the name *Hakenbühse* spread till it became the generic name for small arms, and that the original form of the weapon then took the name of *arquebus à croc*. The French form *arquebuse* and Italian *arcobugio*, *archibugio*, often and wrongly supposed to indicate the hackbut's affinity with the crossbow ("hollow bow" or "mouthed bow"), are popular corruptions, the Italian being apparently the earlier of the two and supplanting the first and purest French form *haquebut*. Previous to the

French wars in Italy, hand-gun men and even arbalisters seem to have been called arquebusiers, but in the course of these wars the arquebus or hackbut came into prominence as a distinct type of weapon. The Spanish arquebusiers, who used it with the greatest effect in the Italian wars, notably at Bicocca (1522) and Pavia (1525), are the originators of modern infantry fire action. Filippo Strozzi made many improvements in the arquebus about 1530, and his weapons were effective up to four and five hundred paces. He also standardized the calibres of the arquebuses of the French army, and from this characteristic feature of the improved weapon arose the English term “caliver.” In the latter part of the 16th century (*c*. 1570) the arquebus began to be displaced by the musket.

ARQUES-LA-BATAILLE, a village of France, in the department of Seine-Inférieure, 4 m. S.E. of Dieppe by the Western railway. Pop. (1906) 1250. Arques is situated near the confluence of the rivers Varenne and Bethune; the forest of Arques stretches to the north-east. The interest of the place centres in the castle dominating the town, which was built in the 11th century by William of Arques; his nephew, William the Conqueror, regarding it as a menace to his own power, besieged and occupied it. After frequently changing hands, it came into the possession of the English, who were expelled in 1449 after an occupation of thirty years. In 1589 its cannon decided the battle of Arques in favour of Henry IV. Since 1869 the castle has been state property. The first line of fortification was the work of Francis I.; the second line and the donjon date back to the 11th century. The

church of Arques, a building of the 16th century, preserves a fine stone rood screen, statuary, stained glass and other relics of the Renaissance period.

ARRACK, RACK or RAK, a generic name applied to a variety of spirituous liquors distilled in the Far East. According to some authorities the word is derived from the Arabic *arak* (perspiration), but according to others (see Morewood's *History of Inebriating Liquors*, 1834, p. 140) it is derived from the *areca-nut*, a material from which a variety of arrack was long manufactured, and is of Indian origin. The liquor to which this or a similar name is applied is (or was, since the introduction of European spirits and methods of manufacture is gradually causing the native spirit industries on the old lines to decay) manufactured in India, Ceylon, Siam, Java, Batavia, China, Corea, &c., and its manufacture still constitutes a considerable industry. The term arrack as designating a distilled liquor does not, however, appear to have been confined to the Far East, as, in Timkowski's *Travels*, it is stated that a spirit distilled from koumiss (*q.v.*) by the Tatars, Mongols and presumably the Caucasian races generally, is called *arrack, araka or ariki*. In Ceylon arrack is distilled chiefly from palm toddy, which is the fermented juice drawn from the unexpanded flower-spathes of various palms, such as the Palmyra palm (*Borassus flabelliformis*) and the cocoa palm (*Cocos nucifera*). At the beginning of the 19th century the arrack industry of Ceylon was of considerable dimensions, whole woods being set apart for no other purpose than that of procuring toddy, and the distillation of the spirit took place at every village round the coast. The land rents in 1831 included a sum of £35,573 on the cocoa-nut trees, and the duties on

the manufacture and retail of the spirit amounted to over £30,000. On the Indian continent arrack is made from palm toddy, rice and the refuse of the sugar refineries, but mainly from the flowers of the muohwa or mahua tree (*Bassia latifolia*). The mahua flowers are very rich in sugar, and may, according to H.H. Mann, contain as much as 58% of fermentable sugar, calculated on the total solids. Even at the present day the process of manufacture is very primitive, the fermentation as a rule being carried on in so concentrated a liquid that complete fermentation rarely takes place. According to Mann, the total sugar in the liquor ready for fermentation may reach 20%. The ferment employed (it is so impure that it can scarcely be called yeast) is obtained from a previous fermentation, and, as the latter is never vigorous, it is not surprising that the resulting spirit contains, compared with the more scientifically prepared European spirits, a very high proportion of by-products (acid, fusel oil, &c.). The injurious nature of these native spirits has long been known and has been frequently set down to the admixture of drugs, such as hemp (*ganga*), but a recent investigation of this question appears to show that this is not generally the case. The chemical constitution of these liquors alone affords sufficient proof of their inferior and probably injurious character.

See H.H. Mann, *The Analyst* (1904).

ARRAH, a town of British India, headquarters of Shahabad district, in the Patna division of Bengal, situated on a navigable canal connecting the river Sone with the Ganges. It is a station on the East Indian railway, 368 m. from Calcutta. In 1901 the population was 40,170. Arrah is famous for an

incident in the Mutiny, when a dozen Englishmen, with 50 Sikhs, defended an ordinary house against 2000 Sepoys and a multitude of armed insurgents, perhaps four times that number. A British regiment, despatched to their assistance from Dinapur, was disastrously repulsed; but they were ultimately relieved, after eight days' continuous fighting, by a small force under Major (afterwards Sir Vincent) Eyre.

ARRAIGNMENT (from Lat. *ad*, to, and *rationare*, to reason, call to account), a law term, properly denoting the calling of a person to answer in form of law upon an indictment. After a true bill has been found against a prisoner by the grand jury, he is called by name to the bar, the indictment is read over to him, and he is asked whether he be guilty or not of the offence charged. This is the arraignment. Formerly, it was usual to require the prisoner to hold up his hand, in order to identify him the more completely, but this practice is now obsolete, as well as that of asking him how he will be tried. His plea in answer to the charge is then entered, or a plea of not guilty is entered for him if he stands mute of malice and refuses to plead, If a person is mute by the visitation of God (*i.e.* deaf and dumb), it will be no bar to an arraignment if intelligence can be conveyed to him by signs or symbols. If he pleads guilty, sentence may be passed forthwith; if he pleads not guilty, he is then given in charge to a jury of twelve men to inquire into the truth of the indictment. He may also plead in abatement, or to the jurisdiction, or demur on a point of law. Several defendants, except those entitled to the privilege of peerage, charged on the same indictment, are arraigned together.

In Scots law the term for arraignment is *calling the diet*.

The *Clerk of Arraigns* is a subordinate officer attached to assize courts and to the Old Bailey. He is appointed by the clerk of assize (see ASSIZE) and acts as his deputy. He assists at the arraignment of prisoners, and puts the formal questions to the jury when delivering their verdict.

ARRAN, EARLS OF. The extinct Scottish title of the earls of Arran (not to be confused with the modern Irish earls of Arran—from the Arran or Aran Islands, Galway—a title created in 1762) was borne by some famous characters in Scottish history. Except the first earl, Thomas Boyd (see ARRAN), and James Stewart, all the holders of this title were members of the Hamilton family.

JAMES HAMILTON, 1st earl of Arran of the new creation (*c.* 1475-1529), son of James, 1st Lord Hamilton, and of Mary Stewart, daughter of James II. of Scotland, was born about 1475, and succeeded in 1479 to his father's titles and estates. In 1489 he was made sheriff of Lanark, was appointed a privy councillor to James IV., and in 1503 negotiated in England the marriage between the king and Margaret Tudor. Hamilton excelled in the knightly exercises of the day, and the same year on the 11th of August, after distinguishing himself in a famous tournament, he was created earl and justiciary of Arran. In 1504 as lieutenant-general of the realm he was employed in reducing the Hebrides, and about the same time in an expedition with 10,000 men in aid of John, king of Denmark. In 1507 he was sent ambassador to France, and on his return through England was

seized and imprisoned by Henry VII. After the accession of Henry VIII., Arran, in 1509, signed the treaty of peace between the two countries, and later, when hostilities began, was given command of a great fleet equipped for the aid of France in 1513. The expedition proved a failure, Arran wasting time by a useless attack on Carrickfergus, lingering for months on the Scottish coast, and returning with a mere remnant of his fleet, the larger ships having probably been purchased by the French government. During his absence the battle of Flodden had been lost, and Arran found his rival Angus, who enjoyed Henry's support, married to the queen dowager and in control of the government. Arran naturally turned to the French party and supported the regency of the duke of Albany. Later, however, becoming impatient of the latter's monopoly of power, he entered into various plots against him, and on Albany's departure in 1517 he was chosen president of the council of regency and provost of Edinburgh. The same year he led an expedition to the border to punish the murderers of the French knight La Bastie. In September, however, after a temporary absence with the young king, the gates of Edinburgh were shut against him by the Douglases, and on the 30th of April 1520 the fierce fight of "Cleanse the Causeway" took place in the streets between the two factions, in which the Hamiltons were worsted. The quarrel, however, between Angus and his wife, the queen-mother, with whom Arran now allied himself, gave the latter another opportunity of regaining power, which he held from 1522, after Albany's return to France, till 1524, when he was forced to include Angus in the government. In 1526, on the refusal of the latter to give up his control of the king on the expiry of his term of office, Arran took up arms, but retreated before Angus's forces, and having made terms with him, supported him in his close custody of the king, in September defeating the earl of Lennox, who was marching to Edinburgh to liberate James. On the proscription of Angus and the Douglases, Arran joined the king at Stirling. He died in 1529. His eldest son James succeeded him.

JAMES HAMILTON, 2nd earl of Arran and duke of Châtelherault (*c.* 1515-1575), accompanied James V. in 1536 to France, and on the latter's death in 1542 was, in consequence of his position as next successor to the throne after the infant Mary, proclaimed protector of the realm and heir-presumptive of the crown, in 1543. He was a zealous supporter of the reformation, authorized the translation and reading of the Scriptures in the vulgar tongue, and at first supported the English policy in opposition to Cardinal Beaton, whom he arrested on the 27th of January 1543, arranging the treaty with England and the marriage of Mary with Prince Edward in July, and being offered by Henry the hand of the princess Elizabeth for his son. But on the 3rd of September he suddenly joined the French party, met Beaton at Stirling, and abjured his religion for Roman Catholicism. On the 13th of January 1544, with Angus, Lennox and others, he signed a bond repudiating the English alliance. In 1544 an attempt was made to transfer the regency from him to Mary of Lorraine, but Arran fortified Edinburgh and her forces retired; in March 1545 a truce was arranged by which each had a share in the government. Meanwhile, immediately on the repudiation of the treaty, war had broken out with England, and Arran was unable either to maintain order within the realm or defend it from outside aggression, the Scots being defeated at Pinkie on the 10th of September 1547. He reluctantly agreed in July 1548 to the marriage of the dauphin with Mary, whom he had designed for his son, to the appeal for French aid, and to the removal of Mary for security to France, and on the 5th of February 1549 was created duke of Châtelherault in Poitou, his eldest son James being henceforth commonly styled earl of Arran. In June 1548 he had also been made a knight of the order of St Michael in France. On the 12th of April 1554 he abdicated in favour of the queen-mother, whose government he supported till after the capture of Edinburgh in October 1559 by the lords of the congregation, when he declared himself on their side and took the Covenant. The same month he was one of the council of the Protestant

lords, joined them in suspending Mary of Lorraine from the regency, and was made provisionally one of the governors of the kingdom. In order to discredit him with the English government a letter was forged by his enemies, in which Arran declared his allegiance to Francis II., but the plot was exposed. On the 27th of February 1560 he agreed to the treaty of Berwick with Elizabeth, which placed Scotland under her protection. The death the same year of Francis II. renewed his hopes of a union between his son and Mary, but disappointment drove him into an attitude of hostility to the court. In 1562 he was accused by his son, probably already insane, of plots against Mary's person, and he was obliged to give up Dumbarton Castle. Lennox claimed precedence over Arran in the succession to the throne, on the plea of the latter's supposed illegitimacy, and his restoration to favour in 1564, together with the project of Mary's marriage with Darnley, still further embittered Arran; he refused to appear at court, was declared a traitor, and fled to England, where on his consent to go into exile for five years he received a pardon from Mary. In 1566 he went to France, where he made vain attempts to regain his confiscated duchy. After the murder of Darnley in 1567 he was nominated by Mary on her abdication one of the regents, and he returned to Scotland in 1569 as a strong supporter of her cause. In March in an assembly of nobles called by Murray, he acknowledged James as king, but on the 5th of April he was arrested for not fulfilling the compact, and continued in confinement till April 1570. After Murray's assassination in January 1570, the regency in July was given to Lennox, and in June 1571 Arran assembled a parliament, when it was declared that Mary's abdication was obtained by fear, and the king's coronation was annulled. On the 28th of August he was declared a traitor and "forfeited," but he continued to support Mary's hopeless cause and to appeal for help to France and Spain, in spite of the pillage of his houses and estates, till February 1573, when he acknowledged James's authority and laid down his arms. He died on the 22nd of January 1575. He was by

general consent a weak, fickle man, whose birth alone called him to high office. He married Margaret, daughter of James Douglas, 3rd earl of Morton, and had, besides several daughters, four sons: James, who succeeded him as 3rd earl of Arran, John, 1st marquess of Hamilton, David, and Claud, Lord Paisley, ancestor of the dukes of Abercorn.

JAMES HAMILTON, 3rd earl (*c.* 1537-1609), was styled earl of Arran after the creation of his father as duke of Châtelherault in 1549; the latter title did not descend to him, having been resumed by the French crown. His father's ambition destined him for the hand of Mary queen of Scots, and his union with the princess Elizabeth was proposed by Henry VIII. as the price of his father's adherence to the English interest. He was early involved in the political troubles in which Scotland was then immersed. In 1546 he was seized as a hostage at St Andrews by the murderers of Cardinal Beaton and released in 1547. In 1550 he went to France, was given the command of the Scots guards, and in 1557 distinguished himself in the defence of St Quentin. He became a strong adherent of the reformed doctrine. His arrest was ordered by Henry II. in 1559, Mary (probably in consequence of his projected union with Elizabeth which would have raised the Hamiltons higher than the Stuarts) declaring her wish that he should be "used as an arrant traitor." He, however, escaped to Geneva and then to England, and had an interview with Elizabeth in August. He returned to Scotland in September, where he supported his father's adherence to the lords of the Congregation against Mary of Lorraine, upheld the alliance with Elizabeth, and became one of the leaders of the Protestant party in the subsequent fighting, in particular organizing, together with Lord James Stuart (afterwards earl of Murray), in 1560, a stubborn resistance to the French at Dysart, and saving Fife. In November 1559 he had declined Bothwell's challenge to single combat. Subsequently he signed the treaty of Berwick, became one of the lords of the Congregation, and was appointed a visitor for the destruction of the religious houses. The same year proposals were

again made for his marriage with Elizabeth, which were rejected by the latter in 1561; and subsequently after the death of Francis II. (in December 1560), he became, with the strong support of the Protestants and Hamiltons, a suitor for Mary, also without success. He was chosen a member of her council on her arrival in Scotland in 1561, but took up a hostile attitude to the court in consequence of the practice of the Roman Catholic religion. He now showed marked signs of insanity, and was confined in Edinburgh Castle, where he remained till May 1566. He had then lost the power of speech, and from 1568 he lived in retirement with his mother at Craignethan Castle, while his estates were administered by his brother John, afterwards 1st marquess of Hamilton. In 1579, at the time of the fresh prosecution of the Hamiltons, when the helpless Arran was also included in the attainder of his brothers and his titles forfeited, the castle was besieged on the pretence of delivering him from unlawful confinement, and Arran and his mother were brought to Linlithgow, while the charge of his estates was taken over by the government. In 1580 James Stewart (see below) was appointed his guardian, and in 1581 acquired the earldom; but his title and estates were restored after Stewart's disgrace in 1586, when the forfeiture was repealed. Arran died unmarried in March 1609, the title devolving on his nephew James, 2nd marquess of Hamilton.

JAMES STEWART (d. 1595), the rival earl of Arran above referred to, was the son of Andrew Stewart, 2nd Lord Ochiltree. He served in his youth with the Dutch forces in Holland against the Spanish, and returned to Scotland in 1579. He immediately became a favourite of the young king, and in 1580 was made gentleman of the bedchamber and tutor of his cousin, the 3rd earl of Arran. The same year he was the principal accuser of the earl of Morton, and in 1581 was rewarded for having accomplished the latter's destruction by being appointed a member of the privy council, and by the grant the same year, to the prejudice of his ward, of the earldom of Arran and the Hamilton estates, on the pretence that the children of his grandmother's

father, the 1st earl of Arran, by his third wife, from whom sprang the succeeding earls of Arran, were illegitimate. He claimed the position of second person in the kingdom as nearest to the king by descent. The same year he married Elizabeth, daughter of John Stewart, earl of Atholl, and wife of the earl of March, after both had been compelled to undergo the discipline of the kirk on account of previous illicit intercourse. He became the rival of Lennox for the chief power in the kingdom, but both were deprived of office by the raid of Ruthven on the 22nd of August 1582, and Arran was imprisoned till September under the charge of the earl of Gowrie. In 1583, however, he assembled a force of 12,000 men against the new government; the Protestant lords escaped over the border, and Arran, returning to power, was made governor of Stirling Castle and in 1584 lord chancellor. The same year Gowrie was captured through Arran's treachery and executed after the failure of the plot of the Protestant lords against the latter's government. He now obtained the governorship of Edinburgh Castle and was made provost of the city and lieutenant-general of the king's forces. Arran induced the English government to refrain from aiding the banished lords, and further secured his power by the forfeitures of his opponents. His tyranny and insolence, however, stirred up a multitude of enemies and caused his rapid fall from power. His agent in England, Patrick, Master of Gray, was secretly conspiring against him at Elizabeth's court. On account of the murder of Lord Russell on the border in July 1585, of which he was accused by Elizabeth, he was imprisoned at the castle of St Andrews, and subsequently the banished lords with Elizabeth's support entered Scotland, seized the government and proclaimed Arran a traitor. He fled in November, and from this time his movements are furtive and uncertain. In 1586 he was ordered to leave the country, but it is doubtful whether he ever quitted Scotland. He contrived secretly to maintain friendly communications with James, and in 1592 returned to Edinburgh, and endeavoured unsuccessfully to get reinstated in the court and kirk.

Subsequently he is reported as making a voyage to Spain, probably in connexion with James's intrigues with that country. His unscrupulous and adventurous career was finally terminated towards the close of 1595 by his assassination near Symontown in Lanarkshire at the hands of Sir James Douglas (nephew of his victim the earl of Morton), who carried his head in triumph on the point of a spear through the country, while his body was left a prey to the dogs and swine. He had three sons, the eldest of whom became Lord Ochiltree.

ARRAN, the largest island of the county of Bute, Scotland, at the mouth of the Firth of Clyde. Its greatest length, from the Cock of Arran to Bennan Head, is about 20 m., and the greatest breadth—from Drumadoon Point to King's Cross Point—is 11 m. Its area is 105,814 acres or 165 sq. m. In 1891 its population was 4824, in 1901, 4819 (or 29 persons to the sq. m.). In 1901 there were 1900 persons who spoke English and Gaelic and nine Gaelic only. There is daily winter communication with Brodick and Lamlash by steamer from Ardrossan, and in summer by many steamers which call not only at these piers, but at Corrie, Whiting Bay and Loch Ranza.

The chief mountains are in the north. The highest is Goatfell (2866 ft., the name said to be a corruption of the Gaelic *Goadh Bhein*, "mountain of the winds"). Others are Caistel Abhail (2735 ft., "peaks of the castles"), Beinn Tarsuinn (2706 ft.), Cir Mhor (2618 ft.) and Beinn Nuis (2597 ft.). In the south Tighvein (1497 ft.) and Cnoc Dubh (1385 ft.) are the most important. Owing to the mountainous character of the island, glens are

numerous. Glen Rosa and Glen Sannox are remarkable for their wild beauty, and among others are Iorsa, Catacol, Chalmadale, Cloy, Shant, Shurig, Tuie, Clachan, Monamore, Ashdale (with two cascades) and Scorrodale. Excepting Loch Tanna, the inland lakes are small. Loch Ranza, an arm of the sea, is one of the most beautiful in Scotland. The streams, or "waters" as they are called, are nearly all hill burns, affording good fishing.

The oldest rocks, consisting of slate, mica-schists and grits, which have been correlated with the metamorphic series of the eastern Highlands, form an incomplete ring round the granite in the north of the island and occupy the whole of the west coast from Loch Ranza south to Dougrie. On the east side in North Glen Sannox Burn, they are associated with cherts, grits and dark schists with pillowy lavas, tuffs and agglomerates which, on lithological grounds, have been regarded as probably of the same age as the Arenig cherts and volcanic rocks in the south of Scotland. The Lower Old Red Sandstone strata are separated from the foregoing series by a fault and forma curving belt extending from Corloch on the east coast south by Brodick Castle to Dougrie on the west shore. Consisting of red sandstones, mudstones and conglomerates, they are inclined at high angles usually away from the granite massif and the encircling metamorphic rocks. They are associated with a thin band of lava visible on the west side of the island near Auchencar and traceable inland to Garbh Thorr. The Upper Old Red Sandstone, composed of red sandstone and conglomerates, is only sparingly developed. The strata occur on the east shore between the Fallen Rocks and Corrie, and they appear along a narrow strip to the east and south of the lower division of the system, between Sannox Bay and Dougrie. On the north side of North Glen Sannox they rest unconformably on the Lower Old Red rocks. Contemporaneous lavas, highly decomposed, are intercalated with this division on the north side of North Glen Sannox where the band is highly faulted. The Carboniferous rocks of Arran include representatives of the Calciferous Sandstone, the three subdivisions of the Carboniferous

Limestone series, and to a small extent the Coal Measures, and are confined to the north part of the island. They appear on the east coast between the Fallen Rocks and the Cock of Arran, where they form a strip about a quarter of a mile broad, bounded on the west by a fault. Here there is an ascending sequence from the Calciferous Sandstone, through the Carboniferous Limestone with thin coals formerly worked, to the Coal Measures, the strata being inclined at high angles to the north. On the south side of a well-marked anticline in the Upper Old Red Sandstone at North Sannox, the Carboniferous strata reappear on the coast with a south dip showing a similar ascending sequence for about half a mile. The lower limestones are well seen at Corrie, but the thin coals are not there represented. From Corrie they can be traced southwards and inland to near the head of Ben Lister Glen. The small development of Upper Carboniferous strata, visible on the shore south of Corrie and in Ben Lister Glen, consists of sandstones, red and mottled clays and purple shales, which yield plant-remains of Upper Carboniferous facies. These may represent partly the Millstone Grit and partly the Coal Measures. Contemporaneous volcanic rocks, belonging to three stages of the Carboniferous formation, occur in Arran. The lowest group is on the horizon of the Calciferous Sandstone series, being visible at Corrie where it underlies the Corrie limestone, and is traceable southwards beyond Brodick. The second is represented by a thin lava, associated with the Upper Limestone group of the Carboniferous Limestone series, and the highest is found in Ben Lister Glen intercalated with the Upper Carboniferous strata, and may be the equivalent of the volcanic series which, in Ayrshire, occupies the position of the Millstone Grit. The Triassic rocks are arranged in two groups, a lower, composed of conglomerates and sandstones, and an upper one consisting of red and mottled shales and marls with thin sandstones and nodular limestones. In the extreme north at the Cock of Arran, there is a small development of these beds; they also occupy the whole of the east coast south of Corrie, and they spread over the south

part of the island south of a line between Brodick Bay and Machrie Bay on the west. At Corrie and the Cock of Arran they rest on Upper Carboniferous strata; in Ben Lister Glen, on the lower limestone group of the Carboniferous Limestone series; and on the west coast they repose on the Old Red Sandstone. There is, therefore, a clear discordance between the Trias and all older strata in Arran. The former extension of Rhaetic, Liassic and Cretaceous formations in the island is indicated by the presence of fragments of these strata in a large volcanic vent on the plateau, on the south side of the road leading from Brodick to Shiskine. The fossils from the Rhaetic beds belong to the *Avicula contorta* zone, those from the Lias to the *Ammonites angulatus* zone, while the blocks of limestone with chert contain *Inoceramus*, Cretaceous foraminifera and other organisms. The materials yielding these fossils are embedded in a course volcanic agglomerate which gives rise to crags and is pierced by acid and basic igneous rocks. One of the striking features in the geology of Arran is the remarkable series of intrusive igneous rocks of Tertiary age which occupy nearly one-half of the area and form the wildest and grandest scenery in the island. Of these the most important is the great oval mass of granite in the North, composed of two varieties; one, coarse-grained and older, forms the outside rim, while the fine-grained and newer type occurs in the interior. Another granite area appears on the south side of the road between Brodick and Shiskine, where it is associated with granophyre and quartz-diorite and traverses the volcanic vent of post-Cretaceous or Tertiary age already described. In the south of the island there are sills and dykes of felsite, quartz-porphyry, rhyolite, trachyte and pitchstone. The felsite sheets are well represented in Holy Island. It is worthy of note that the dykes and sheets of felsite are seldom pierced by the basalt dykes and are probably about the most recent of the intrusive rocks. The best example of the basic sills forms the Clauchland Hills and runs out to sea at Clauchland Point.

Finally the basic dykes of dolerite, basalt and augite-andesite are abundant and traverse the various sedimentary formations and the granite.

The chief crops are oats and potatoes. Cattle and sheep are raised in considerable numbers. The game, which is abundant, consisting of blackcock and grouse, is strictly preserved. A few red deer still occur in the wilder hilly district. The fisheries are of some value. Loch Ranza being an important station.

Standing stones, cairns and other memorials of a remote antiquity occur near Tormore, on Machrie Bay, Lamlash, and other places. The Norse raiders found a home in Arran for a long period until the defeat of Haakon V. at Largs (1263) compelled them to retire. The chief name in the island's history is that of Robert Bruce, who found shelter in the King's Caves on the western coast. One was reputed to be his kitchen, another his cellar, a third his stable, while the hill above was styled the King's Hill. From a point still known as King's Cross he crossed over to Carrick, in answer to the signal which warned him that the moment for the supreme effort for his country was come. In Glen Cloy the ruins of a fort bear the name of Bruce's Castle, in which his men lay concealed, and on the southern arm of Loch Ranza stands a picturesque ruined castle which is said to have been his hunting-seat. Kildonan Castle, near the south-easternmost point, is a fine ruin of the 14th century, once a royal stronghold. The island gave the title of earl to Thomas Boyd, who married the elder sister of James III., a step so unpopular with his peers that he had to fly the country, and the title soon afterwards passed to the Hamiltons. Brodick Castle, the ancestral seat of the dukes of Hamilton, is a splendid mansion on the northern shore of Brodick Bay.

Brodick is the chief village in Arran, but most of the dwelling-houses have been built at Invercloy, close to the pier. Three m. south (by road) is Lamlash, on a fine bay so completely sheltered by Holy Island as to form an

excellent harbour for ships of all sizes. Four m. to the north lies the village of Corrie which takes its name from a rugged hollow in the hill of Am Binnein (2172 ft.) which overshadows it. Daniel Macmillan (1813-1857), the founder of the publishing firm of Macmillan & Co., was a native of Corrie.

About a mile and a half east of Lamlash village lies Holy Island, which forms a natural breakwater to the bay. It is 1¾ m. long, nearly ¾ m. wide, and its finely-marked basaltic cone rises to a height of 1030 ft. The island takes its name from the fact that St Molios, a disciple of St Columba, founded a church near the north-western point. In the saint's cave on the shore may be seen the rocky shelf on which he made his bed, but his remains were interred in the hamlet of Clachan, some 2 m. from Blackwaterfoot. Off the south-eastern coast, ¾ m. from Port Dearg, lies the pear-shaped isle of Pladda, which serves as the telegraph station from which the arrival of vessels in the Clyde is notified to Glasgow and Greenock.

ARRANT (a variant of "errant," from Lat. *errare*, to wander), a word at first used in its original meaning of wandering, as in "knight-errant," thus an arrant or itinerant preacher, an arrant thief, one outlawed and wandering at large; the meaning easily passed to that of self-declared, notorious, and by the middle of the 16th century was confined, as an intensive adjective, to words of opprobrium and abuse, an arrant coward meaning thus a self-declared, downright coward.

ARRAS, a city of northern France, chief town of the department of Pas-de-Calais, 38 m. N.N.E. of Amiens on the Northern railway between that city and Lille. Pop (1906) 20,738. Arras is situated in a fertile plain on the right and southern bank of the Scarpe, at its junction with the Crinchon which skirts the town on the south and east. Of the fortifications erected by Vauban in the 17th century, only a gateway and the partially dismantled citadel, nicknamed *la Belle Inutile*, are left. The most interesting quarter lies in the east of the town, where the lofty houses which border the spacious squares known as the Grande and the Petite Place are in the Flemish style. They are built with their upper storeys projecting over the footway and supported on columns so as to form arcades; beneath these are deep cellars extending under the squares themselves. The celebrated hôtel de ville of the 16th century overlooks the Petite Place; its belfry, which contains a fine peal of bells, rises to a height of 240 ft. The decoration is in the richest Gothic style, and is especially admirable in the case of the windows. Of the numerous ecclesiastical buildings the cathedral, a church of the 18th century possessing some good pictures, is the most important. It occupies the site of the church of the abbey of St Vaast, the buildings of which adjoin it and contain the bishop's palace, the ecclesiastical seminary, a museum of antiquities, paintings and sculptures, and a rich library.

Arras is the seat of a prefect and of a bishop. It has tribunals of first instance and of commerce, a chamber of commerce, a branch of the Bank of France, a communal college, training colleges, and a school of military engineering. Its industrial establishments include oil-works, dye-works and breweries, and manufactories of hosiery, railings and other iron-work, and of oil-cake. For the tapestry manufacture formerly flourishing at Arras see TAPESTRY. It has a very important market for cereals and oleaginous grains. The trade of the town is facilitated by the canalization of the Scarpe, the basin of which forms the port.

Before the opening of the Christian era Arras was known as *Nemetacum*, or *Nemetocenna*, and was the chief town of the Atrebates, from which the word Arras is derived. Passing under the rule of the Romans, it became a place of some importance, and traces of the Roman occupation have been found. In 407 it was destroyed by the Vandals, and having been partially rebuilt, came into the hands of the Franks. Christianity was introduced by St Vedast (Vaast), who founded a bishopric at Arras about 500. This was soon transferred to Cambrai, but brought back to its original seat about 1100. As the chief town of the province of Artois, Arras passed to Baldwin I., count of Flanders, in 863, and about 880 was ravaged by the Normans. During this troubled period it retained some vestiges of its former trade, and the woollen manufacture was established here at an early date. Early in the 12th century a commune was established here, but the earliest known charter only dates from about 1180; owing to the importance of Arras, this soon became a model for many neighbouring communes. At this time the city appears to have been divided into two parts, one dependent upon the bishop, and the other upon the count. When Philip Augustus, king of France, married Isabella, niece of Philip, count of Flanders, Arras came under the rule of the French king, who confirmed its privileges in 1194. As part of Artois it came in 1237 to Robert, son of Louis VIII., king of France, and in 1384 to Philip the Bold, duke of Burgundy, who promised to respect its privileges. Anxious to recover the city for France, Louis XI. placed a garrison therein after the death of Charles the Bold, duke of Burgundy, in 1477. This was driven out by the inhabitants, and Louis then stormed Arras, razed the walls, deported the citizens, whose places were taken by Frenchmen, and changed the name to *Franchise*. The successor of Louis, Charles VIII., restored the city to its former name and position, and as part of the inheritance of Mary, daughter and heiress of Charles the Bold, it was contended for by the French king, and his rival, the German king, Maximilian I. The peace of Senlis in 1493 gave Arras to Maximilian, and in

spite of attacks by the French, it remained under the rule of the Habsburgs until 1640. Taken in this year by the French, this capture was ratified by the peace of the Pyrenees in 1659, and henceforward it remained part of France. It suffered severely during the French Revolution, especially from Joseph Lebon, who, like the brothers Maximilien and Augustin Robespierre, was a native of the town. Owing to its position and importance, Arras has been the scene of various treaties. In 1414 the peace between the Armagnacs and the Burgundians was made here, and in 1435 a congress met here to make peace between the English and their Burgundian allies on the one side, and the French on the other, and after the English representatives had withdrawn, a treaty was signed on the 20th of September between France and Burgundy. In 1482 Louis XI. made a treaty here with the estates and towns of Flanders about the inheritance of Mary of Burgundy, wife of the German king Maximilian I.

See E. Lecesne, *Histoire d'Arras jusqu'en 1789* (Arras, 1880); *Arras sous la Révolution* (Arras, 1882-1883).

ARRAY (from the O. Fr. *areyer*, Med. Lat. *arredare*, to get ready), an orderly arrangement, particularly the drawing up of an army in position of battle. From the 13th century onwards in England "Commissions of Array" issued from the king for the levy of military forces (see MILITIA). In English law the term is used for the setting in order, name by name, of the panel of a jury, which may be challenged as a whole, "to the array," or individually, "to the polls."

ARRENOTOKOUS, ARRENOTOKY (from Gr. ἄρρην, male, and τόκος from τίκτειν, to beget), biological terms proposed by Leuckart and Eduard von Siebold to denote those parthenogenetic females which produce male young, while "thelytokous" and "thelytoky" would denote their producing female young.

ARREST (Fr. *arrester, arrêter*, to stop or stay), the restraint of a man's person, for the purpose of compelling him to be obedient to the law. It is defined to be the execution of the command of some court of record or officer of justice.

Arrests in England are either in civil or in criminal cases.

I. *In Civil Cases.*—The arrest must be by virtue of a precept or order out of some court, and must be effected by corporal seizing or touching the defendant's body, or as directed by the writ, *capias et attachias*, take and catch hold of. And if the defendant make his escape it is a *rescous*, or rescue, and attachment may be had against him, and the bailiff may then justify the breaking open of the house in which he is, to carry him away.

Arrests on mesne process (see PROCESS), before judgment obtained, were abolished by the Debtors Act 1869, s. 6; an exception, however, is made in

cases in which the plaintiff proves, at any time before final judgment, by evidence on oath to the satisfaction of a judge of one of the superior courts, that he has a good cause of action to the amount of £50, that the defendant is about to quit the country, and that his absence will materially prejudice the plaintiff in prosecuting his action. In such cases an order for arrest may be obtained till security to the amount of the claim be found.

Formerly a judgment creditor might arrest his debtor under a writ of *capias ad satisfaciendum*, but since 1869 imprisonment for debt has been abolished in England, except in certain cases, and in these the period of detention must not exceed one year.

The following persons are privileged from arrest, viz., 1st, members of the royal family and the ordinary servants of the king or queen regnant, chaplains, lords of the bedchamber, &c. This privilege does not extend to servants of a consort queen or dowager. 2nd, peers of the realm, peeresses by birth, creation or marriage, Scottish and Irish peers and peeresses. 3rd, members of the House of Commons during the session of parliament, and for a convenient time (forty days) before and after it. Members of Convocation appear to have the same privilege. 4th, foreign ambassadors and their "domestics and domestic servants." Temporary privilege from arrest in civil process is enjoyed by barristers travelling on circuit, by parties, witnesses or attorneys connected with a cause, and by clergymen whilst performing divine service.

The arrest of any privileged person is irregular *ab initio*, and the party may be discharged on motion. The only exception is as to indictable crimes, such as treason, felony and breach of the peace.

There are no longer any places where persons are privileged from arrest, such as the Mint, Savoy, Whitefriars, &c., on the ground of their being ancient palaces.

Except in cases of treason, felony or breach of the peace, an arrest cannot be made on a Sunday, and if made it is void (Sunday Observance Act 1677); but it may be made in the night as well as in the day.

II. *In Criminal Cases.*—All persons whatsoever are, without distinction, equally liable to this arrest, and any man may arrest without warrant or precept, and outer doors may be broken open for that purpose. The arrest may be made,—1st, by warrant; 2nd, by an officer without warrant; 3rd, by a private person without warrant; or, 4th, by a hue and cry.

1. Warrants are ordinarily granted by justices of the peace on information or complaint in writing and upon oath, and they must be indorsed when it is intended they should be executed in another county by a magistrate of that county (see Indictable Offences Act 1848). A warrant issued by a metropolitan police magistrate can be executed anywhere by a metropolitan police officer. Warrants are also granted in cases of treason or other offence affecting the government by the privy council, or one of the secretaries of state, and also by the chief or other justice of the court of king's bench (*bench-warrant*) in cases of felony, misdemeanour or indictment found, or criminal information granted in that court. Every warrant ought to specify the offence charged, the authority under which the arrest is to be made, the person who is to execute it and the person who is to be arrested. A warrant remains in force till executed or discharged by order of a court. An officer may break open doors in order to execute a warrant in cases of treason, felony or indictable offences, provided that, on demand, admittance cannot otherwise be obtained. (See WARRANT.)

2. The officers who may arrest without warrant are,—justices of the peace, for felony or breach of the peace committed in their presence; the sheriff and the coroner in their county, for felony; constables, for treason, felony or breach of the peace committed in their view,—and within the

metropolitan police district they have even larger powers (Metropolitan Police Acts 1829-1895).

3. A private person is bound to arrest for a felony committed in his presence, under penalty of fine and imprisonment. By the Prevention of Offences Act 1851, a private person is allowed to arrest any one whom he finds committing an indictable offence by night, and under the Malicious Damage Act 1861, any person committing an offence against that act may be arrested without warrant by the owner of the property damaged, or his servants, or persons authorized by him. So, too, by the Coinage Offences Act 1861. s. 31, any person may arrest any one whom he shall find committing any offence relating to the coin, or other offence against that act.

A person arrested without warrant must not be detained in private custody but must be taken with all convenient speed to a police station or justice and there charged (Summary Jurisdiction Act 1879).

4. The arrest by hue and cry is where officers and private persons are concerned in *pursuing* felons, or such as have dangerously wounded others. By the Fugitive Offenders Act 1881, provision was made for the arrest in the United Kingdom of persons committing treason, and felony in any of the British colonies and vice versa; as to the arrest of fugitives in foreign countries see EXTRADITION.

The remedy for a wrongful arrest is by an action for false imprisonment.

In Scotland the law of arrest in criminal procedure has a general constitutional analogy with that of England, though the practice differs with the varying character of the judicatories. Colloquially the word arrest is used in compulsory procedure for the recovery of debt; but the technical term applicable in that department is *caption*, and the law on the subject is generically different from that of England. There never was a practice in

Scottish law corresponding with the English arrest in mesne process; but by old custom a warrant for caption could be obtained where a creditor made oath that he had reason to believe his debtor meditated flight from the country, and the writ so issued is called a warrant against a person *in meditatione fugae*. Imprisonment of old followed on ecclesiastical cursing, and by fiction of law in later times it was not the creditor's remedy, but the punishment of a refractory person denounced rebel for disobedience to the injunctions of the law requiring fulfilment of his obligation. The system was reformed and stripped of its cumbrous fictions by an act of the year 1837. Although the proceedings against the person could only follow on completed process, yet, by a peculiarity of the Scottish law, documents executed with certain formalities, and by special statute bills and promissory notes, can be registered in the records of a court for execution against the person as if they were judgments of the court.

The general principles as to the law of arrest in most European countries correspond more or less exactly to those prevailing in England.

An *arrest of a ship*, which is the method of enforcing the admiralty process *in rem*, founded either on a maritime lien or on a claim against the ship, is dealt with under ADMIRALTY JURISDICTION.

See also article ATTACHMENT.

Arrest of Judgment is the assigning just reason why judgment should not pass, notwithstanding verdict given, either in civil or in criminal cases, and from intrinsic causes arising on the face of the record.

United States.—The law of arrest assimilates to that existing in England. Actual manual touching is not necessary (*Pike v. Hanson*, 9 N.H. 491; *Hill* v. *Taylor*, 50 Mich. 549); words of arrest by the officer, not protested against and no resistance offered, are sufficient (*Emery* v. *Chesley*, 18 N.H. 198; *Goodell* v. *Tower*, 1904, 58 Am. Rep. 790). Words of arrest, staying

over night at prisoner's house, going with him before the magistrate next day constitute arrest (*Courtery* v. *Dozier*, 20 Ga. 369). Restraining a person in his own house is arrest.

In civil cases in most of the states arrest for debt is abolished, except in cases of fraud or wilful injury to persons or property by constitutional provision or by statute. One arrested under process of a federal court cannot be arrested under that of a state court for the same cause. There is no provision in the United States constitution as to imprisonment for debt, but congress has enacted (in Rev. Stat., s. 990) that all the provisions of the law of any state applicable to such imprisonment shall apply to the process of federal courts in that state. A woman can be arrested in New York for wilful injury to person, character or property, and in certain other cases (Code, s. 553). The president, federal officials, governors of states, members of congress and of state legislatures (during the session), marines, soldiers and sailors on duty, voters while going to and from the polls, judges, court officials (1904, 100 N.W. 591), coroners and jurors while attending upon their public duties, lawyers, parties and witnesses while going to, attending or returning from court, and generally married women without separate property, are exempt from arrest.

In criminal cases a bench-warrant in New York may be served in any county without being backed by a magistrate (Code Crim. Proc., s. 304). In Nebraska one found violating the law may be arrested and detained until a legal warrant can be issued (Crim. Code, s. 283). A bail may lawfully recapture his principal (1905) 121 Georgia Rep. 594. Foreign ambassadors and ministers and their servants are exempt from arrest. Exemption from arrest is a privilege, not of the court, as in England, but of the person, and can be waived (*Petrie* v. *Fitzgerald*, 1 Daly 401).

ARRESTMENT, in Scots law, the process by which a creditor detains the goods or effects of his debtor in the hands of third parties till the debt due to him shall be paid. It is divided into two kinds: (1) Arrestment in security, used when proceedings are commencing, or in other circumstances where a claim may become, but is not yet, enforceable; and (2) Arrestment in execution, following on the decree of a court, or on a registered document, under a clause or statutory power of registration, according to the custom of Scotland. By the process of arrestment the property covered is merely retained in place; to realize it for the satisfaction of the creditor's claim a further proceeding called "furthcoming" is necessary. By old practice, alimentary funds, *i.e.* those necessary for subsistence, were not liable to arrestment. By the Wages Arrestment Limitation (Scotland) Act 1870, the wages of all labourers, farm-servants, manufacturers, artificers and work-people are not arrestable except (1) in so far as they exceed 20s. per week; but the expense of the arrestment is not to be charged against the debtor unless the sum recovered exceed the amount of the said expense; or (2) under decrees for alimentary allowances and payments, or for rates and taxes imposed by law.

ARRETIUM (mod. *Arezzo*), an ancient city of Etruria, in the upper valley of the Arno, situated on the Via Cassia, 50 m. S.E. of Florentia. The site of the original city is not quite certain; some writers place it on the isolated hill called Poggio di S. Cornelio, 2½ m. to the S.E., where remains of a fortified *enceinte* still exist (cf. F. Noack in *Römische Mitteilungen*, 1897, p. 186); while others maintain, and probably rightly, that it occupied

the hill at the summit of the modern town, where the medieval citadel (*fortezza*) was erected, and which was enclosed by an ancient wall. Numerous Etruscan tombs have been discovered within the lower portion of the area of the modern town, which appears to correspond in site with the Roman (*C.I.L.* xi. p. 1082; G. Gamurrini in *Notizie degli scavi*, 1883, 262; 1887, 437). Vitruvius (ii. 8. 9) and Pliny (*Nat. Hist.* xxxv. 173) speak of the strength of its walls of bricks, but these have naturally disappeared. Many remains of Roman buildings have been discovered within the modern town, and the amphitheatre is still visible in the southern angle. Arretium appears as one of the cities which aided the Tarquins after their expulsion. It was an opponent of Rome at the end of the 4th and beginning of the 3rd century B.C., but soon sought for help against the attacks of the Gauls, against whom it was almost a frontier fortress. It was an important Roman base during the Hannibalic wars (though at one time it threatened defection—Livy xxvii. 21-24), and in 205 B.C. was able to furnish Scipio with a considerable quantity of arms and provisions (Livy xxviii. 45). In 187 B.C. the high road was extended as far as Bononia. Arretium took the part of Marius against Sulla, and the latter settled some of his veterans there as colonists. Caesar, or Octavian, added others, so that there are three classes, *Arretini veteres, Fidentiores*, and *Iulienses*. A considerable contingent from Arretium joined Catiline and in 49 B.C. Caesar occupied it. C. Maecenas[1] was perhaps a native of Arretium. Its fertility was famous in ancient times, and still more the red pottery made of the local clay, with its imitation of chased silver. The reliefs upon it are sometimes of considerable beauty, and large quantities of it, and the sites of several of the kilns, have been discovered in and near Arretium. It was also considerably exported. See *Corp. Inscrip. Lat.* xi. (Berlin, 1901) p. 1081, and *Notizie degli scavi, passim* (especially, 1884, 369, for the discovery of a fine group of the moulds from which these vases were made). The museum contains a very fine collection of these and a good collection of medieval majolica.

(T. As.)

1 The name Cilnius was apparently never borne by Maecenas himself, though he is so described, *e.g.* by Tacitus, *Ann*. vi. II, cf. Macrob. ii. 4, 12. The Cilnii with whom Maecenas was connected were a noble Etruscan family.

ARRHENIUS, SVANTE AUGUST (1859-), Swedish physicist and chemist, was born on the 19th of February 1859, at Schloss Wijk, near Upsala. He studied at Upsala from 1876 to 1881 and at Stockholm from 1881 to 1884, then returning to Upsala as privat-docent in physical chemistry. He spent two years from 1886 to 1888 in travelling, and visited Riga Polytechnic and the universities of Würzburg, Graz, Amsterdam and Leipzig. In 1891 he was appointed lecturer in physics at Stockholm and four years later became full professor. Arrhenius is specially associated with the development of the theory of electrolytic dissociation, and his great paper on the subject, *Recherches sur la conductibilité galvanique des électrolytes*—(1) *conductibilité galvanique des solutions aqueuses extrêmement diluées*, (2) *théorie chimique des électrolytes*, was presented to the Stockholm Academy of Sciences in 1883. He was subsequently continuously engaged in extending the applications of the doctrine of electrolytic conduction in relation not only to the problems of chemical action but also, on the supposition that in certain conditions the air conducts electrolytically, to the phenomena of atmospheric electricity. In 1900 he published a *Lärobok i teoretik elektrokemi*, which was translated into German and English, and his *Lehrbuch der kosmischen Physik* appeared in 1903. In 1904 he delivered at the university of California a course of lectures, the object of which was to illustrate the application of the methods of physical chemistry to the study of the theory of toxins and antitoxins, and

which were published in 1907 under the title *Immunochemistry*. In his *Worlds in the Making* (1908), an English translation of *Das Werden der Welten* (1907), he combated the generally accepted doctrine that the universe is tending to what Clausius termed *Wärmetod* through exhaustion of all sources of heat and motion, and suggested that by virtue of a mechanism which maintains its available energy it is self-renovating, energy being "degraded" in bodies which are in the solar state, but "elevated" or raised to a higher level in bodies which are in the nebular state. He further put forward the conception that life is universally diffused, constantly emitted from all habitable worlds in the form of spores which traverse space for years or ages, the majority being ultimately destroyed by the heat of some blazing star, but some few finding a resting-place on bodies which have reached the habitable stage.

ARRIA, in Roman history, the heroic wife of Caecina Paetus. When her husband was implicated in the conspiracy of Scribonianus against the emperor Claudius (A.D. 42), and condemned to death, she resolved not to survive him. She accordingly stabbed herself with a dagger, which she then handed to him with the words, "Paetus, it does not hurt" (*Paete, non dolet*; see Pliny, *Epp.* iii. 16; Martial i. 14; Dio Cassius lx. 16). Her daughter, also called Arria, was the wife of Thrasea Paetus. When he was condemned to death by Nero, she would have imitated her mother's example, but was dissuaded by her husband, who entreated her to live for the sake of their children. She was sent into banishment (Tacitus, *Annals*, xvi. 34).

ARRIAN (FLAVIUS ARRIANUS), of Nicomedia in Bithynia, Greek historian and philosopher, was born about A.D. 96, and lived during the reigns of Hadrian, Antoninus Pius and Marcus Aurelius. In recognition of his abilities, he received the citizenship of both Athens and Rome. He was greatly esteemed by Hadrian, who appointed him governor (*legatus*) of Cappadocia (131-137), in which capacity he distinguished himself in a campaign against the Alani. This is the only instance before the 3rd century in which a first-rate Roman military command was given to a Greek. Arrian spent a considerable portion of his time at Athens, where he was archon 147-148. With his retirement or recall from Cappadocia his official career came to an end. In his declining years, he retired to his native place, where he devoted himself to literary work. He died about 180. His biography, by Dio Cassius, is lost.

When young, Arrian was the pupil and friend of Epictetus, who had probably withdrawn to Nicopolis, when Domitian expelled all philosophers from Rome. He took verbatim notes of his teacher's lectures, which he subsequently published under the title of *The Dissertations* (Διατριβαί), in eight books, of which the first four are extant and constitute the chief authority for Stoic ethics, and *The Encheiridion* (*i.e.* Manual) *of Epictetus*, a handbook of moral philosophy, for many years a favourite instruction book with both Christians and pagans. It was adapted for Christian use by St Nilus of Constantinople (5th century), and Simplicius (about 550) wrote a commentary on it which we still possess.

The most important of Arrian's original works is his *Anabasis of Alexander*, in seven books, containing the history of Alexander the Great from his accession to his death. Arrian's chief authorities were, as he tells us, Aristobulus of Cassandreia and Ptolemy, son of Lagus (afterwards king of Egypt), who both accompanied Alexander on his campaigns. In spite of a

too indulgent view of his hero's defects, and some over-credulity, Arrian's is the most complete and trustworthy account of Alexander that we possess.

Other extant works of Arrian are: *Indica*, a description of India in the Ionic dialect, including the voyage of Nearchus, intended as a supplement to the *Anabasis; Acies Contra Alanos*, a fragment of importance for the knowledge of Roman military affairs; *Periplus of the Euxine*, an official account written (131) for the emperor Hadrian; *Tactica*, attributed by some to Aelianus, who wrote in the reign of Trajan; *Cynegeticus*, a treatise on the chase, supplementing Xenophon's work on the same subject; the *Periplus of the Erythraean Sea*, attributed to him, is by a later compiler. Amongst his lost works may be mentioned: Τὰ μετ᾽ Ἀλέξανδρον, a history of the period succeeding Alexander, of which an epitome is preserved in Photius; histories of Bithynia, the Alani and the Parthian wars under Trajan; the lives of Timoleon of Syracuse, Dion of Syracuse and a famous brigand named Timoleon. Arrian's style is simple, lucid and manly; but his language, though pure, presents some peculiarities. He was called "Xenophon the younger" from his imitation of that writer, and he even speaks of himself as Xenophon.

Complete works ed. F. Dubner (1846); *Anabasis*, C. Abicht (1889); with notes, C.W. Kniger (1835), C. Sintenis (1867) C. Abicht (1875); *Scripta Minora*, R. Hercher and A. Eberhard (1885), A.J. Roos, i., containing the *Anabasis* (Teubner series, 1907). English translations *Anabasis*, Rooke (1812), *Anabasis* and *Indica*, E.J. Chinnock (1893); *Voyage of Nearchus* with the spurious *Periplus*, W. Vincent (1807), J.W. M'Crindle (Calcutta, 1879), *Periplus of the Euxine*, W. Falconer (1805), Cynegettcus [W. Dansey] (1831). See also E. Bolla, *Arriano di Nicomedia* (1890); E. Schwartz in Pauly-Wissowa's *Realencyclopädie der classischen Altertumswissenschaft* (1896), H.F. Pelham, "Arrian as

Legate of Cappadocia," in *English Historical Review*, October 1896; article GREECE: *History, ancient*, "Authorities."

ARRIS (Fr. *areste*, or *arête*), in architecture, the sharp edge or angle in which two sides or surfaces meet.

ARRONDISSEMENT (from *arrondir*, to make round), an administrative subdivision of a department in France. Dating nominally from 1800, the arrondissement was really a re-creation of the "district" of 1790. It comprises within itself the canton and the commune. It differs from the department and from the commune in being merely an administrative division and not a complete legal personality with power to acquire and possess. The purposes for which it exists are, again, unlike those of the department and the commune, comparatively limited. It is the electoral district for the chamber of deputies, each arrondissement returning one member; if the population is in excess of 100,000 it is divided into two or more constituencies. It is also a judicial district having a court of first instance. It is under the control of a sub-prefect. There are 362 arrondissements in the 87 departments. Each arrondissement has a council, with as many members as there are cantons, whose function is to subdivide among the communes their *quota* of the direct taxes charged to the

arrondissement by the general council of the department. (See FRANCE) Somewhat different from the arrondissements of the department are the arrondissements (20 in number) into which Paris is divided. They bear a certain resemblance to the sub-municipalities created in London by the London Government Act 1899, and each forms a local administrative unit (see PARIS).

France is also subdivided, for purposes of defence, into five *maritime* divisions, termed arrondissements. Instituted originally under the Consulate, they were suppressed in 1815, but re-established again in 1826. They are under the direction of maritime prefects, who, by a decree of 1875, must be vice-admirals in the navy.

ARROWROOT. A large proportion of the edible starches obtained from the rhizomes or root-stocks of various plants are known in commerce under the name of arrowroot. Properly the name should be restricted to the starch yielded by two or three species of *Maranta* (nat. ord. Marantaceae), the chief of which is *M. arundinacea*; and when genuine or West Indian arrowroot is spoken of, it is understood that this is the variety meant. *Maranta arundinacea* is probably a native of Guiana and western Brazil, but it has long been cultivated in the West Indian Islands, and has now spread to most tropical countries. The plant is a herbaceous perennial with a creeping root-stock which gives off fleshy cylindrical branches or tubers, covered with pale brown or white scales and afterwards ringed with their scars. It is at the period when these tubers are gorged with starch, immediately before the season of rest, that it is ripe for use. In addition to

about 25% of starch, the tubers contain a proportion of woody tissue, vegetable albumen and various salts. The arrowroot may be separated on a small scale in the same manner as potato-starch is frequently prepared, that is, by peeling the root and grating it in water, when the starch falls to the bottom. The liquor is then drained off, and the starch purified by repeated washings till it is ready for drying. On a large scale the manufacture of arrowroot is conducted with specially arranged machinery. The rhizomes when dug up are washed free of earthy impurities and afterwards skinned. Subsequently, according to Pereira's *Materia Medica*, "the carefully skinned tubers are washed, then ground in a mill, and the pulp washed in tinned-copper cylindrical washing-machines. The fecula (dim. of Lat. *faex*, dregs, or sediment) is subsequently dried in drying-houses. In order to obtain the fecula free from impurity, pure water must be used, and great care and attention paid in every step of the process. The skinning or peeling of the tubers must be performed with great nicety, as the cuticle contains a resinous matter which imparts colour and a disagreeable flavour to the starch. German-silver palettes are used for skinning the deposited fecula, and shovels of the same metal for packing the dried fecula. The drying is effected in pans, covered with white gauze to exclude dust and insects."

FIG. 1. FIG. 2.

Arrowroot Plant (*Maranta arundinacea*).—Fig. 1, stem, leaves and flowers; fig. 2, tubers.

Arrowroot is distinguished by the granules agglomerating into small balls, by slightly crepitating when rubbed between the fingers, and by yielding with boiling water a fine, transparent, inodorous and pleasant-tasting jelly. In microscopic structure the granules present an ovoid form, marked with concentric lines very similar to potato-starch, but readily distinguished by having a “hilum” marking at the thick extremity of the granule, while in potato-starch the same appearance occurs at the thin end (compare figs. 3 and 4 below). In addition to the West Indian supplies, arrowroot is found in the commerce of Brazil, the East Indies, Australia, Cape Colony and Natal.

FIG. 3. FIG. 4.

FIG. 5. FIG. 6.

Starch Granules magnified.

Fig. 3. Potato.
Fig. 4. Arrowroot.
Fig. 5. Tous-les-mois.
Fig. 6. Manihot.

The name “arrowroot” is derived from the use by the Mexican Indians of the juice of the fresh root as an application to wounds produced by poisoned arrows. Sir Hans Sloane refers to it in his *Catalogue of Jamaica Plants* (1696), and it is said to have been introduced into England by William Houston about 1732. It is grown as a stove-plant in botanic gardens. The slender, much-branched stem is 5 or 6 ft. high, and bears numerous leaves with long, narrow sheaths and large spreading ovate blades, and a few short-stalked white flowers.

Tous-les-mois, or Tulema arrowroot, also from the West Indies, is obtained from several species of *Canna*, a genus allied to *Maranta*, and cultivated in the same manner. The granules of *tous-les-mois* are readily distinguishable by their very large size (fig. 5). East Indian arrowroot is

obtained from the root-stocks of several species of the genus *Curcuma* (nat. ord. Zingiberaceae), chiefly *C. angustifolia*, a native of central India. Brazilian arrowroot is the starch of the cassava plant, a species of Manihot (fig. 6), which when agglutinated on hot plates forms the tapioca of commerce. The cassava is cultivated in the East Indian Archipelago as well as in South America. *Tocca*, or *Otaheite* arrowroot, is the produce of *Tacca pinnatifida*, the pia plant of the South Sea Islands. Portland arrowroot was formerly prepared on the Isle of Portland from the tubers of the common cuckoo-pint, *Arum maculatum*. Various other species of arum yield valuable food-starches in hot countries. Under the name of British arrowroot the farina of potatoes is sometimes sold, and the French excel in the preparation of imitations of the more costly starches from this source. The chief use, however, of potato-farina as an edible starch is for adulterating other and more costly preparations. This falsification can readily be detected by microscopic examination, and the accompanying drawings exhibit the appearance under the microscope of the principal starches we have described. Although these starches agree in chemical composition, their value as articles of diet varies considerably, owing to different degrees of digestibility and pleasantness of taste. Arrowroot contains about 82% of starch, and about 1% of proteid and mineral matter. Farina, or British arrowroot, at about one-twelfth the price, is just as useful and pleasant a food.

ARROWSMITH, the name of an English family of geographers. The first of them, Aaron Arrowsmith (1750-1823), migrated to London from

Winston in Durham when about twenty years of age, and was employed by John Gary, the engraver. In 1790 he made himself famous by his large chart of the world on Mercator's projection. Four years later he published another large map of the world on the globular projection, with a companion volume of explanation. The maps of North America (1796) and Scotland (1807) are the most celebrated of his many later productions. He left two sons, Aaron and Samuel, the elder of whom was the compiler of the *Eton Comparative Atlas*, of a Biblical atlas, and of various manuals of geography. They carried on the business in company with John Arrowsmith (1790-1873), nephew of the elder Aaron. In 1834 John published his *London Atlas*, the best set of maps then in existence. He followed up the atlas with a long series of elaborate and carefully executed maps, those of Australia, America, Africa and India being especially valuable. In 1863 he received the gold medal of the Royal Geographical Society, of which body he was one of the founders.

ARROYO (O. Sp. *arrogio*, Lat. *arrogium*, a rivulet or stream), the channel of a stream cut in loose earth, found often at the head of a gully, where the water flows only at certain seasons of the year.

ARSACES, a Persian name, which occurs on a Persian seal, where it is written in cuneiform characters. The most famous Arsaces was the chief of the Parni, one of the nomadic Scythian or Dahan tribes in the desert east of the Caspian Sea. A later tradition, preserved by Arrian, derives Arsaces I. and Tiridates from the Achaemenian king Artaxerxes II., but this has evidently no historical value. Arsaces, seeking refuge before the Bactrian king Diodotes, invaded Parthia, then a province of the Seleucid empire, about 250 B.C. (Strabo xi. p. 515, cf. Arrian p. 1, Müller, in Photius, *Cod.* 58, and Syncellus p. 284). After two years (according to Arrian) he was killed, and his brother Tiridates, who succeeded him and maintained himself for a short time in Parthia, during the dissolution of the Seleucid empire by the attacks of Ptolemy III. (247 ff.), was defeated and expelled by Seleucus II. (about 238). But when this king was forced, by the rebellion of his brother, Antiochus Hierax, to return to the west, Tiridates came back and defeated the Macedonians (Strabo xi. pp. 513, 515; Justin xli. 4; Appian, *Syr.* 65; Isidorus of Charax 11). He was the real founder of the Parthian empire, which was of very limited extent until the final decay of the Seleucid empire, occasioned by the Roman intrigues after the death of Antiochus IV. Epiphanes (165 B.C.), enabled Mithradates I. and his successors to conquer Media and Babylonia. Tiridates adopted the name of his brother Arsaces, and after him all the other Parthian kings (who by the historians are generally called by their proper names), amounting to the number of about thirty, officially wear only the name Arsaces. With very few exceptions only the name ΑΡΣΑΚΗΣ (with various epithets) occurs on the coins of the Parthian kings, and the obverse generally shows the seated figure of the founder of the dynasty, holding in his hand a strung bow. The Arsacidian empire was overthrown in A.D. 226 by Ardashir (Artaxerxes), the founder of the Sassanid empire, whose conquests began about A.D. 212. The name Arsaces of Persia is also borne by some kings of Armenia, who were of Parthian origin. (See PERSIA and PARTHIA.)

(ED. M.)

ARS-AN-DER-MOSEL, a town of Germany, in the imperial province Alsace-Lorraine, 5 m. S. of Metz on the railway to Novéant. It has a handsome Roman Catholic church and extensive foundries. In the vicinity are the remains of a Roman aqueduct, which formerly spanned the valley. Pop. 5000.

ARSCHOT, PHILIPPE DE CROY, DUKE OF (1526-1595), governor-general of Flanders, was born at Valenciennes, and inherited the estates of the ancient and wealthy family of Croy. Becoming a soldier, he was made a knight of the order of the Golden Fleece by Philip II., king of Spain, and was afterwards employed in diplomatic work. He took part in the troubles in the Netherlands, and in 1563 refused to join William the Silent and others in their efforts to remove Cardinal Granvella from his post. This attitude, together with Arschot's devotion to the Roman Catholic Church, which he expressed by showing his delight at the massacre of St Bartholomew, led Philip of Spain to regard him with still greater favour, which, however, was withdrawn in consequence of Arschot's ambiguous conduct when welcoming the new governor, Don John of Austria, to the Netherlands in 1576. In spite, however, of his being generally distrusted by the inhabitants of the Netherlands, he was appointed governor of the citadel of Antwerp when the Spanish troops withdrew in 1577. After a period of vacillation he

deserted Don John towards the end of that year. Jealous of the prince of Orange, he was then the head of the party which induced the archduke Matthias (afterwards emperor) to undertake the sovereignty of the Netherlands, and soon afterwards was appointed governor of Flanders by the state council. A strong party, including the burghers of Ghent, distrusted the new governor; and Arschot, who was taken prisoner during a riot at Ghent, was only released on promising to resign his office. He then sought to regain the favour of Philip of Spain, and having been pardoned by the king in 1580 again shared in the government of the Netherlands; but he refused to serve under the count of Fuentes when he became governor-general in 1594, and retired to Venice, where he died on the 11th of December 1595.

See J.L. Motley, *The Rise of the Dutch Republic*.

ARSENAL, an establishment for the construction, repair, receipt, storage and issue of warlike stores; details as to *matériel* will be found under AMMUNITION, ORDNANCE, &c. The word "arsenal" appears in various forms in Romanic languages (from which it has been adopted into Teutonic), *i.e.* Italian *arzanale*, Spanish *arsenal*, &c.; Italian also has *arzana* and *darsena*, and Spanish a longer form *atarazanal*. The word is of Arabic origin, being a corruption of *daraṣ-ṣinā'ah*, house of trade or manufacture, *dar*, house, *al*, the, and *ṣina'ah*, trade, manufacture, *ṣana'a*, to make. Such guesses as *arx navalis*, naval citadel, *arx senatus* (*i.e.* of Venice, &c.), are now entirely rejected.

A first-class arsenal, which can renew the *matériel* and equipment of a large army, embraces a gun factory, carriage factory, laboratory and small-arms ammunition factory, small-arms factory, harness, saddlery and tent factories, and a powder factory; in addition it must possess great store-houses. In a second-class arsenal the factories would be replaced by workshops. The situation of an arsenal should be governed by strategical considerations. If of the first class, it should be situated at the base of operations and supply, secure from attack, not too near a frontier, and placed so as to draw in readily the resources of the country. The importance of a large arsenal is such that its defences would be on the scale of those of a large fortress. The usual subdivision of branches in a great arsenal is into A, Storekeeping; B, Construction; C, Administration. Under A we should have the following departments and stores:—Departments of issue and receipt, pattern room, armoury department, ordnance or park, harness, saddlery and accoutrements, camp equipment, tools and instruments, engineer store, magazines, raw material store, timber yard, breaking-up store, unserviceable store. Under B—Gun factory, carriage factory, laboratory, small-arms factory, harness and tent factory, powder factory, &c. In a second-class arsenal there would be workshops instead of these factories. C—Under the head of administration would be classed the chief director of the arsenal, officials military and civil, non-commissioned officers and military artificers, civilian foremen, workmen and labourers, with the clerks and writers necessary for the office work of the establishments. In the manufacturing branches are required skill, and efficient and economical work, both executive and administrative; in the storekeeping part, good arrangement, great care, thorough knowledge of all warlike stores, both in their active and passive state, and scrupulous exactness in the custody, issue and receipt of stores. For fuller details the reader is referred to papers by Sir E. Collen, R.A., in vol. viii., and Lieut. C.E. Grover, R.E., in vol. vi. *Proceedings of R. Artillery Institution*. In

England the Royal Arsenal, Woolwich, manufactures and stores the requirements of the army and navy (see WOOLWICH).

ARSENIC (symbol As, atomic weight 75.0), a chemical element, known to the ancients in the form of its sulphides. Aristotle gave them the name σανδαράκη, and Theophrastus mentions them under the name ἀρσενικόν. The oxide known as white arsenic is mentioned by the Greek alchemist Olympiodorus, who obtained it by roasting arsenic sulphide. These substances were all known to the later alchemists, who used minerals containing arsenic in order to give a white colour to copper. Albertus Magnus was the first to state that arsenic contained a metal-like substance, although later writers considered it to be a bastard or semi-metal, and frequently called it *arsenicum rex*. In 1733 G. Brandt showed that white arsenic was the calx of this element, and after the downfall of the phlogiston theory the views concerning the composition of white arsenic were identical with those which are now held, namely that it is an oxide of the element.

Arsenic is found in the uncombined condition in various localities, but more generally in combination with other metals and sulphur, in the form of more or less complex sulphides. Native arsenic is usually found as granular or curvilaminar masses, with a reniform or botryoidal surface. These masses are of a dull grey colour, owing to surface tarnish; only on fresh fractures is the colour tin-white with metallic lustre. The hardness is 3.5 and the specific gravity 5.63-5.73. Crystals of arsenic belong to the rhombohedral system, and have a perfect cleavage parallel to the basal plane; natural

crystals are, however, of rare occurrence, and are usually acicular in habit. Native arsenic occurs usually in metalliferous veins in association with ores of antimony, silver, &c.; the silver mines of Freiberg in Saxony, St Andreasberg in the Harz, and Chañarcillo in Chile being well-known localities. Attractive globular aggregates of well-developed radiating crystals have been found at Akatani, a village in the province Echizen, in Japan.

Arsenic is a constituent of the minerals arsenical iron, arsenical pyrites or mispickel, tin-white cobalt or smaltite, arsenical nickel, realgar, orpiment, pharmacolite and cobalt bloom, whilst it is also met with in small quantities in nearly all specimens of iron pyrites. The ordinary commercial arsenic is either the naturally occurring form, which is, however, more or less contaminated with other metals, or is the product obtained by heating arsenical pyrites, out of contact with air, in earthenware retorts which are fitted with a roll of sheet iron at the mouth, and an earthenware receiver. By this method of distillation the arsenic sublimes into the receiver, leaving a residue of iron sulphide in the retort. For further purification, it may be sublimed, after having been previously mixed with a little powdered charcoal, or it may be mixed with a small quantity of iodine and heated. It can also be obtained by the reduction of white arsenic (arsenious oxide) with carbon. An electro-metallurgical process for the extraction of arsenic from its sulphides has also been proposed (German Patent. 67,973). These compounds are brought into solution by means of polysulphides of the alkali metals and the resultant liquor run into the cathode compartment of a bath, which is divided by diaphragms into a series of anode and cathode chambers; the anode divisions being closed and gas-tight, and containing carbon or platinum electrodes. The arsenic solution is decomposed at the cathode, and the element precipitated there.

Arsenic possesses a steel-grey colour, and a decided metallic lustre; it crystallizes on sublimation and slow condensation in rhombohedra, isomorphous with those of antimony and tellurium. It is very brittle. Its specific gravity is given variously from 5.395 to 5.959; its specific heat is 0.083, and its coefficient of linear expansion 0.00000559 (at 40° C.). It is volatile at temperatures above 100° C. and rapidly vaporizes at a dull red heat. It liquefies when heated under pressure, and its melting point lies between 446° C. and 457° C. The vapour of arsenic is of a golden yellow colour, and has a garlic odour. The vapour density is 10.6 (air = 1) at 564° C., corresponding to a tetratomic molecule As_4; at a white heat the vapour density shows a considerable lowering in value, due to the dissociation of the complex molecule.

By condensing arsenic vapour in a glass tube, in a current of an indifferent gas, such as hydrogen, amorphous arsenic is obtained, the deposit on the portion of the tube nearest to the source of heat being crystalline, that farther along (at a temperature of about 210° C.) being a black amorphous solid, while still farther along the tube a grey deposit is formed. These two latter forms possess a specific gravity of 4.710 (14° C.) [A. Bettendorff, *Annalen*, 1867, 144, p. 110], and by heating at about 358°-360° C. pass over into the crystalline variety. Arsenic burns on heating in a current of oxygen, with a pale lavender-coloured flame, forming the trioxide. It is easily oxidized by heating with concentrated nitric acid to arsenic acid, and with concentrated sulphuric acid to arsenic trioxide; dilute nitric acid only oxidizes it to arsenious acid. It burns in an atmosphere of chlorine forming the trichloride; it also combines directly with bromine and sulphur on heating, while on fusion with alkalis it forms arsenites.

Arsenic and most of its soluble compounds are very poisonous, and consequently the methods used for the detection of arsenic are very important. For full accounts of methods used in detecting minute traces of

arsenic in foods, &c., see "Report to Commission to Manchester Brewers' Central Association," the *Analyst*, 1900, 26, p. 8; "Report of Conjoint Committee of Society of Chemical Industry and Society of Public Analysts," the *Analyst*, 1902, 27, p. 48; T.E. Thorpe, *Journal of the Chemical Society*, 1903, 83, p. 774; O. Hehner and others, *Journal of Society of Chemical Industry*, 1902, 21, p. 94; also ADULTERATION.

Arsenic and arsenical compounds generally can be detected by (*a*) *Reinsch's test*: A piece of clean copper is dipped in a solution of an arsenious compound which has been previously acidified with pure hydrochloric acid. A grey film is produced on the surface of the copper, probably due to the formation of a copper arsenide. The reaction proceeds better on heating the solution. On removing, washing and gently drying the metal and heating it in a glass tube, a white crystalline sublimate is formed on the cool part of the tube; under the same conditions antimony does not produce a crystalline sublimate.

(*b*) *Fleitmann's test* and *Marsh's test* depend on the fact that arsenic and its compounds, when present in a solution in which hydrogen is being generated, are converted into arseniuretted hydrogen, which can be readily detected either by its action on silver nitrate solution or by its decomposition on heating. In Fleitmann's test, the solution containing the arsenious compound is mixed with pure potassium hydroxide solution and a piece of pure zinc or aluminium foil dropped in and the whole then heated. A piece of bibulous paper, moistened with silver nitrate, is held over the mouth of the tube, and if arsenic be present, a grey or black deposit is seen on the paper, due to the silver nitrate being reduced by the arseniuretted hydrogen. Antimony gives no reaction under these conditions, so that the method can be used to detect arsenic in the presence of antimony, but the test is not so delicate as either Reinsch's or Marsh's method.

In the Marsh test the solution containing the arsenious compounds is mixed with pure hydrochloric acid and placed in an apparatus in which hydrogen is generated from pure zinc and pure sulphuric acid. The arseniuretted hydrogen produced is passed through a tube containing lead acetate paper and soda-lime, and finally through a narrow glass tube, constricted at various points, and heated by a very small flame. As the arseniuretted hydrogen passes over the heated portion it is decomposed and a black deposit formed. Instead of heating the tube, the gas may be ignited at the mouth of the tube and a cold surface of porcelain or platinum placed in the flame, when a black deposit is formed on the surface. This may be distinguished from the similar antimony deposit by its ready solubility in a solution of sodium hypochlorite. A blank experiment should always be carried out in testing for small quantities of arsenic, to ensure that the materials used are quite free from traces of arsenic. It is to be noted that the presence of nitric acid interferes with the Marsh test; and also that if the arsenic is present as an *arsenic* compound it must be reduced to the *arsenious* condition by the action of sulphurous acid. Arsenic compounds can be detected in the dry way by heating in a tube with a mixture of sodium carbonate and charcoal when a deposit of black amorphous arsenic is produced on the cool part of the tube, or by conversion of the compound into the trioxide and heating with dry sodium acetate when the offensive odour of the extremely poisonous cacodyl oxide is produced. In the wet way, arsenious oxide and arsenites, acidified with hydrochloric acid, give a yellow precipitate of arsenic trisulphide on the addition of sulphuretted hydrogen; this precipitate is soluble in solutions of the alkaline hydroxides, ammonium carbonate and yellow ammonium sulphide. Under like conditions arsenates only give a precipitate on long-continued boiling.

Arsenic is usually estimated either in the form of magnesium pyroarsenate or as arsenic sulphide. For the pyroarsenate method it is necessary that the arsenic should be in the *arsenic* condition, if necessary this can be effected by heating with nitric acid; the acid solution is then mixed with "magnesia mixture" and made strongly alkaline by the addition of ammonia. It is then allowed to stand twenty-four hours, filtered, washed with dilute ammonia, dried, ignited to constant weight and weighed, the filter paper being incinerated separately after moistening with nitric acid. From the weight of magnesium pyroarsenate obtained the weight of arsenic can be calculated.

In the sulphide method, the arsenic should be in the *arsenious* form. Sulphuretted hydrogen is passed through the liquid until it is thoroughly saturated, the excess of sulphuretted hydrogen is expelled from the solution by a brisk stream of carbon dioxide, and the precipitate is filtered on a Gooch crucible and washed with water containing a little sulphuretted hydrogen and dried at 100° C.; it is then well washed with small quantities of pure carbon disulphide to remove any free sulphur, again dried and weighed. Arsenic can also be estimated by volumetric methods; for this purpose it must be in the *arsenious* condition, and the method of estimation consists in converting it into the *arsenic* condition by means of a standard solution of iodine, in the presence of a cold saturated solution of sodium bicarbonate.

The atomic weight of arsenic has been determined by many different chemists. J. Berzelius, in 1818, by heating arsenious oxide with excess of sulphur obtained the value 74.3; J. Pelouze (*Comptes rendus*, 1845, 20, p. 1047) titrated arsenic chloride with silver solution and obtained 75.0; and F. Kessler (*Pogg. Ann.* 1861, 113, p. 134) by converting

arsenic trisulphide in hydrochloric acid solution into arsenic pentasulphide also obtained 75.0.

Compounds.—Arsenic forms two hydrides:—The *dihydride*, As_2H_2, is a brown velvety powder formed when sodium or potassium arsenide is decomposed by water. It is a somewhat unstable substance, decomposing on being heated, with liberation of hydrogen. Arsenic *trihydride* (arsine or arseniuretted hydrogen), AsH_3, is formed by decomposing zinc arsenide with dilute sulphuric acid; by the action of nascent hydrogen on arsenious compounds, and by the electrolysis of solutions of arsenious and arsenic acids; it is also a product of the action of organic matter on many arsenic compounds. It is a colourless gas of unpleasant smell, excessively poisonous, very slightly soluble in water. It easily burns, forming arsenious oxide if the combustion proceeds in an excess of air, or arsenic if the supply of air is limited; it is also decomposed into its constituent elements when heated. It liquefies at −40° C. and becomes solid at −118.9° C. (K. Olszewski). Metals such as tin, potassium and sodium, when heated in the gas, form arsenides, with liberation of hydrogen; and solutions of gold and silver salts are reduced by the gas with precipitation of metallic gold and silver. Chlorine, bromine and iodine decompose arsine readily, the action being most violent in the case of chlorine.

Arsenic tribromide, $AsBr_3$, is formed by the direct union of arsenic and bromine, and subsequent distillation from the excess of arsenic; it forms colourless deliquescent prisms which melt at 20°-25° C., and boil at 220° C. Water decomposes it, a small quantity of water leading to the formation of the *oxybromide*, AsOBr, whilst a large excess of water gives arsenious oxide, As_4O_6.

Arsenic certainly forms two, or possibly three iodides. The *di-iodide*, As_2I_4 or AsI_2, which is prepared by heating one part of arsenic with two parts of iodine, in a sealed tube to 230° C., forms dark cherry-red prisms, which are easily oxidized, and are readily decomposed by water. The *tri-iodide*, AsI_3, prepared by subliming arsenic and iodine together in a retort, by leading arsine into an alcoholic iodine solution, or by boiling powdered arsenic and iodine with water, filtering and evaporating, forms brick-red hexagonal tables, of specific gravity 4.39, soluble in alcohol, ether and benzene, and in a large excess of water; in the presence of a small quantity of water, it is decomposed with formation of hydriodic acid and an insoluble basic salt of the composition $4AsOI \cdot 3As_4O_6 \cdot 24H_2O$. It combines with alkaline iodides to form very unstable compounds. The *pentaiodide*, AsI_5, appears to be formed when a mixture of one part of arsenic and seven parts of iodine is heated to 190° C., but on dissolving the resulting product in carbon bisulphide and crystallizing from this solvent, only the tri-iodide is obtained.

Arsenic trichloride, $AsCl_3$, is prepared by distilling white arsenic with concentrated sulphuric acid and common salt, or by the direct union of arsenic with chlorine, or from the action of phosphorus pentachloride on white arsenic. It is a colourless oily heavy liquid of specific gravity 2.205 (0° C.), which, when pure and free from chlorine, solidifies at −18° C., and boils at 132° C. It is very poisonous and decomposes in moist air with evolution of white fumes. With a little water it forms arsenic oxychloride, AsOCl, and with excess of water it is completely decomposed into hydrochloric acid and white arsenic. It combines directly with ammonia to form a solid compound variously given as $AsCl_3 \cdot 3NH_3$, or $2AsCl_3 \cdot 7NH_3$, or $AsCl_3 \cdot 4NH_3$.

Arsenic trifiuoride, AsF_3, is prepared by distilling white arsenic with fluorspar and sulphuric acid, or by heating arsenic tribromide with ammonium fluoride; it is a colourless liquid of specific gravity 2.73, boiling at 63° C.; it fumes in air, and in contact with the skin produces painful wounds. It is decomposed by water into arsenious and hydrofluoric acids, and absorbs ammonia forming the compound $2AsF_3 \cdot 5NH_3$. By the action of gaseous ammonia on arsenious halides at −30° C. to −40° C., *arsenamide*, $As(NH_2)_3$, is formed. Water decomposes it into arsenious oxide and ammonia, and when heated to 60° it loses ammonia and forms *arsenimide*, $As_2(NH)_3$ (C. Hugot, *Compt. rend.* 1904, 139, p. 54). For AsF_5, see *Ber*., 1906, 39, p. 67.

Two oxides of arsenic are definitely known to exist, namely the trioxide (white arsenic), As_4O_6, and the pentoxide, As_2O_5, while the existence of a suboxide, As_2O(?), has also been mooted. Arsenic trioxide has been known from the earliest times, and was called *Hüttenrauch* (furnace-smoke) by Basil Valentine. It occurs naturally in the mineral claudetite, and can be artificially prepared by burning arsenic in air or oxygen. It is obtained commercially by roasting arsenical pyrites in either a Brunton's or Oxland's rotatory calciner, the crude product being collected in suitable condensing chambers, and afterwards refined by resublimation, usually in reverberatory furnaces, the foreign matter being deposited in a long flue leading to the condensing chambers. White arsenic exists in two crystalline forms (octahedral and prismatic) and one amorphous form; the octahedral form is produced by the rapid cooling of arsenic vapour, or by cooling a warm saturated solution in water, or by crystallization from hydrochloric acid, and also by the gradual transition of the amorphous variety, this last phenomenon being attended by the evolution of heat. Its specific gravity is 3.7; it is only slightly soluble in cold water, but is

more soluble in hot water, the solution reacting faintly acid. The prismatic variety of the oxide can be obtained by crystallization from a saturated boiling solution in potassium hydroxide, or by the crystallization of a solution of silver arsenite in nitric acid. Its specific gravity is 4.15. In the amorphous condition it can be obtained by condensing the vapour of the oxide at as high a temperature as possible, when a vitreous mass is produced, which melts at 200° C., has a specific gravity of 3.68-3.798, and is more soluble in water than the crystalline variety.

Arsenious oxide is very poisonous. It acts as a reducing agent; it is not convertible into the pentoxide by the direct action of oxygen; and its solution is reduced by many metals (*e.g.* zinc, tin and cadmium) with precipitation of arsenic and formation of arseniuretted hydrogen. The solution of arsenious oxide in water reacts acid towards litmus and contains tribasic arsenious acid, although on evaporation of the solution the trioxide is obtained and not the free acid. The salts of the acid are, however, very stable, and are known as arsenites. Of these salts several series are known, namely the ortho-arsenites, which are derivatives of the acid H_3AsO_3, the meta-arsenites, derivatives of $HAsO_2$, and the pyro-arsenites, derivatives of $H_4As_2O_5$. The arsenites of the alkali metals are soluble in water, those of the other metals are insoluble in water, but are readily soluble in acids. A neutral solution of an arsenite gives a yellow precipitate of silver arsenite, Ag_3AsO_3, with silver nitrate solution, and a yellowish-green precipitate (Scheele's green) of cupric hydrogen arsenite, $CuHAsO_3$, with copper sulphate solution. By the action of oxidizing agents such as nitric acid, iodine solution, &c., arsenious acid is readily converted into arsenic acid, in the latter case the reaction proceeding according to the equation $H_3AsO_3 + I_2 + H_2O = H_3AsO_4 + 2HI$. Arsenic pentoxide, As_2O_5, is

most easily obtained by oxidation of a solution of arsenious acid with nitric acid; the solution on concentration deposits the compound $2H_3AsO_4 \cdot H_2O$ (below 15° C.), which on being heated to a dark red heat loses its water of crystallization and leaves a white vitreous mass of the pentoxide. This substance dissolves slowly in water, forming arsenic acid; by heating to redness it decomposes into arsenic and oxygen. It deliquesces in moist air, and is easily reduced to arsenic by heating with carbon.

Arsenic acid, H_3AsO_4, is prepared as shown above, the compound $2H_3AsO_4 \cdot H_2O$ on being heated to 100° C. parting with its water of crystallization and leaving a residue of the acid, which crystallizes in needles. On heating to 180° C. it loses water and yields pyroarsenic acid, $H_4As_2O_7$, which at 200° C. loses more water and leaves a crystalline mass of meta-arsenic acid, $HAsO_3$. These latter two acids are only stable in the solid state; they dissolve readily in water with evolution of heat and immediate transformation into the ortho-arsenic acid. The salts of arsenic acid, termed arsenates, are isomorphous with the phosphates, and in general character and reactions resemble the phosphates very closely; thus both series of salts give similar precipitates with “magnesia mixture” and with ammonium molybdate solution, but they can be distinguished by their behaviour with silver nitrate solution, arsenates giving a reddish-brown precipitate, whilst phosphates give a yellow precipitate.

There are three known compounds of arsenic and sulphur, namely, realgar As_2S_2, orpiment As_2S_3, and arsenic pentasulphide As_2S_5. Realgar occurs native in orange prisms of specific gravity 3.5; it is prepared artificially by fusing together arsenic and sulphur, but the resulting products vary somewhat in composition; it is readily fusible

and sublimes unchanged, and burns on heating in a current of oxygen, forming arsenic trioxide and sulphur dioxide.

Orpiment (*auri pigmentum*) occurs native in pale yellow rhombic prisms, and can be obtained in the amorphous form by passing a current of sulphuretted hydrogen gas through a solution of arsenious oxide or an arsenite, previously acidified with dilute hydrochloric acid. It melts easily and volatilizes. It burns on heating in air, and is soluble in solutions of alkaline hydroxides and carbonates, forming thioarsenites, $As_2S_3 + 4KHO = K_2HAsO_3 + K2HAsS_3 + H_2O$. On acidifying the solution so obtained with hydrochloric acid, the whole of the arsenic is reprecipitated as trisulphide, $K_2HAsO_3 + K_2HAsS_3 + 4HCl = 4KCl + 3H_2O + As_2S_3$. Arsenic pentasulphide, As_2S_5, can be prepared by fusing the trisulphide with the requisite amount of sulphur; it is a yellow easily-fusible solid, which in absence of air can be sublimed unchanged; it is soluble in solutions of the caustic alkalis, forming thioarsenates, which can also be obtained by the action of alkali polysulphides on orpiment. The thioarsenites and thioarsenates of the alkali metals are easily soluble in water, and are readily decomposed by the action of mineral acids. Arsenic compounds containing selenium and sulphur are known, such as arsenic seleno-sulphide, $AsSeS_2$, and arsenic thio-selenide, $AsSSe_2$. Arsenic phosphide, AsP, results when phosphine is passed into arsenic trichloride, being precipitated as a red-brown powder.

Many organic arsenic compounds are known, analogous to those of nitrogen and phosphorus, but apparently the primary and secondary arsines, $AsH_2 \cdot CH_3$ and $AsH(CH_3)_2$, do not exist, although the corresponding chlorine derivatives, $AsCl_2 \cdot CH_3$, methyl arsine chloride, and $AsCl(CH_4)_2$, dimethyl arsine chloride, are known. The tertiary arsines, such as $As(CH_3)_3$, trimethyl arsine, and the quaternary

arsonium iodides and hydroxides, $(CH_3)_4AsI$ and $(CH_3)_4As\cdot OH$, tetramethyl arsonium iodide and hydroxide, have been obtained. The arsines and arsine chlorides are liquids of overpowering smell, and in some cases exert an extremely irritating action on the mucous membrane. They do not possess basic properties; the halogen in the chlorine compounds is readily replaced by oxygen, and the oxides produced behave like basic oxides. The chlorides $AsCl_2\cdot CH_3$ and $AsCl(CH_3)_2$ as well as $As(CH_3)_3$ are capable of combining with two atoms of chlorine, the arsenic atom apparently changing from the tri- to the penta-valent condition, and the corresponding oxygen compounds can also be oxidized to compounds containing one oxygen atom or two hydroxyl groups more, forming acids or oxides. The compounds of the type AsX_5, *e.g.* $AsCl_4\cdot CH_3$, $AsCl_3(CH_3)_2$, on heating break down, with separation of methyl chloride and formation of compounds of the type AsX_3; the breaking down taking place more readily the fewer the number of methyl groups in the compound. The dimethyl arsine (or cacodyl) compounds have been most studied. On distillation of equal parts of dry potassium acetate and arsenious oxide, a colourless liquid of unbearable smell passes over, which is spontaneously inflammable and excessively poisonous. It is sometimes called Cadet's fuming liquid, and its composition was determined by R. Bunsen, who gave it the name cacodyl oxide (κακώδης, stinking); its formation may be shown thus:

$$As_4O_6 + 8CH_3CO_2K = 2[(CH_3)_2As]_2O + 4K_2CO_3 + 4CO_2.$$

The liquid is spontaneously inflammable owing to the presence of free cacodyl, $As_2(CH_3)_4$, which is also obtained by heating the oxide with zinc clippings in an atmosphere of carbon dioxide; it is a liquid of overpowering odour, and boils at 170°C. Cacodyl oxide boils at 150°

C., and on exposure to air takes up oxygen and water and passes over into the crystalline cacodylic acid, thus:

$$[(CH_3)_2As]_2O + H_2O + O_2 = 2(CH_3)_2As{\cdot}O{\cdot}OH.$$

Pharmacology.—Of arsenic and its compounds, arsenious acid (dose 1/60-1/15 gr.) and its preparation liquor arsenicalis, Fowler's solution (dose 2-8 ♏), are in very common use. The iodide of arsenic (dose 1/20-1/5 gr.) is one of the ingredients of Donovan's solution (see MERCURY); and iron arsenate (dose 1/16-¼ gr. in a pill), a mixture of ferrous and ferric arsenates with some iron oxide, is of great use in certain cases. Sodium arsenate (1/40-1/10 gr.) is somewhat less commonly prescribed, though all the compounds of this metal have great value in experienced hands.

Externally, arsenious acid is a powerful caustic when applied to raw surfaces, though it has no action on the unbroken skin. Internally, unless the dose be extremely small, all preparations are severe gastro-intestinal irritants. This effect is the same however the drug be administered, as, even after subcutaneous injection, the arsenic is excreted into the stomach after absorption, and thus sets up gastritis in its passage through the mucous membrane. In minute doses it is a gastric stimulant, promoting the flow of gastric juice. It is quickly absorbed into the blood, where its presence can be demonstrated especially in the white blood corpuscles. In certain forms of anaemia it increases the number of the red corpuscles and also their haemoglobin content. None of these known effects of arsenic is sufficient to account for the profound change that a course of the drug will often produce in the condition of a patient. It has some power of affecting the general metabolism, but no wholly satisfactory explanation is forthcoming. According to Binz and Schultz its power is due to the fact that it is an oxygen-carrier, arsenious acid withdrawing oxygen from the protoplasm to form arsenic acid, which subsequently yields up its oxygen again. It is thus

vaguely called an alterative, since the patient recovers under its use. It is eliminated chiefly by the urine, and to a less extent by the alimentary canal, sweat, saliva, bile, milk, tears, hair, &c., but it is also stored up in the body mainly in the liver and kidneys.

Therapeutics.—Externally arsenious acid has been much used by quack doctors to destroy morbid growths, &c., a paste or solution being applied, strong enough to kill the mass of tissue and make it slough out quickly. But many accidents have resulted from the arsenic being absorbed, and the patient thereby poisoned. Internally it is useful in certain forms of dyspepsia, but as some patients are quite unable to tolerate the drug, it must always be administered in very small doses at first, the quantity being slowly increased as tolerance is shown. Children as a rule bear it better than adults. It should never be given on an empty stomach, but always after a full meal. Certain cases of anaemia which do not yield to iron are often much improved by arsenic, though in other apparently similar ones it appears to be valueless. It is the routine treatment for pernicious anaemia and Hodgkin's disease, though here again the drug may be of no avail. For the neuralgia and anaemia following malaria, for rheumatoid arthritis, for chorea and also asthma and hay fever, it is constantly prescribed with excellent results. Certain skin diseases, as psoriasis, pemphigus and occasionally chronic eczema, are much benefited by its use, though occasionally a too prolonged course will produce the very lesion for which under other circumstances it is a cure. A recent method of using the drug is in the form of sodium cacodylate by subcutaneous injection, and this preparation is said to be free from the cumulative effects sometimes arising after the prolonged use of the other forms. Other organic derivatives employed are sodium metharsenite and sodium anilarsenate or atoxyl; hypodermic injections of the latter have been used in the treatment of sleeping sickness. Occasionally, as among the Styrians, individuals acquire the habit of arsenic-eating, which is said to increase their weight, strength

and appetite, and clears their complexion. The probable explanation is that an antitoxin is developed within them.

Toxicology and Forensic Medicine.—The commonest source of arsenical poisoning is the arsenious acid or white arsenic, which in one form is white and opaque, like flour, for which it has been mistaken with fatal results. Also, as it has little taste and no colour it is easily mixed with food for homicidal purposes. When combined with potash or soda it is used to saturate flypapers, and strong solutions can be obtained by soaking these in water; this fact has also been used with criminal intent. Copper arsenite (or Scheele's green) used to be much employed as a pigment for wall-papers and fabrics, and toxic effects have resulted from their use. Metallic arsenic is probably not poisonous, but as it usually becomes oxidized in the alimentary canal, the usual symptoms of arsenical poisoning follow its use.

In acute poisoning the interval between the reception of the poison and the onset of symptoms ranges from ten minutes, or even less, if a strong solution be taken on an empty stomach, to twelve or more hours if the drug be taken in solid form and the stomach be full of food. The usual period, however, is from half an hour to an hour. In a typical case a sensation of heat developing into a burning pain is felt in the throat and stomach. This is soon followed by uncontrollable vomiting, and a little later by severe purging, the stools being first of all faecal but later assuming a rice water appearance and often containing blood. The patient suffers from intense thirst, which cannot be relieved, as drinking is immediately followed by rejection of the swallowed fluid. There is profound collapse, the features are sunken, the skin moist and cyanosed. The pulse is feeble and irregular, and respiration is difficult. The pain in the stomach is persistent, and cramps in the calves of the legs add to the torture. Death may be preceded by coma, but consciousness is often maintained to the end. The similarity of the symptoms to those of cholera is very marked, but if the suspicion arises it

can soon be cleared up by examining any of the secretions for arsenic. More rarely the poison seems to centre itself on the nerve centres, and gastro-intestinal symptoms may be almost or quite absent. In such cases the acute collapse occurs in company with both superficial and deep anaesthesia of the limbs, and is soon followed by coma terminating in death. In criminal poisoning repeated doses are usually given, so that such cases may not be typical, but will present some of the aspects of acute and some of chronic arsenical poisoning. As regards treatment, the stomach must be washed out with warm water by means of a soft rubber tube, an emetic being also administered. Then, if available, freshly precipitated ferric hydrate must be given, which can be prepared by adding a solution of ammonia to one of iron perchloride. The precipitate is strained off, and the patient can swallow it suspended in water. While this is being obtained, magnesia, castor oil or olive oil can be given; or failing all these, copious draughts of water. The collapse must be treated with hot blankets and bottles, and subcutaneous injections of brandy, ether or strychnine. The pain can be lessened by injections of morphia.

Arsenic may be gradually absorbed into the system in very small quantities over a prolonged period, the symptoms of chronic poisoning resulting. The commonest sources used to be wall-papers, fabrics, artificial flowers and toys: also certain trades, as in the manufacture of arsenical sheep-dipping. But at the present time cases arising from these causes occur very rarely. In 1900 an outbreak of “peripheral neuritis” with various skin affections occurred in Lancashire, which was traced to beer made from glucose and invert sugar, in the preparation of which sulphuric acid contaminated with arsenic was said to have been used. But the nature of the disease in this case was decidedly obscure. The symptoms so closely resembled those of *beri-beri* that it has also been suggested that the illness was the same, and was caused by the manufacture of the glucose from mouldy rice (see BERI-BERI), though no proof of this was possible. The

earliest symptoms are slight gastric disorders, loss of appetite and general malaise, followed later by colicky pains, irritation of eyelids and skin eruptions. But sooner or later peripheral neuritis develops, usually beginning with sensory disturbances, tingling, numbness, formication and occasionally cutaneous anaesthesia. Later the affected muscles become exquisitely tender, and then atrophy, while the knee-jerk or other reflex is lost. Pigmentation of the skin may occur in the later stages. Recovery is very slow, and in fatal cases death usually results from heart failure.

After acute poisoning, the stomach at a *post-mortem* presents signs of intense inflammation, parts or the whole of its mucous membrane being of a colour varying from dark red to bright vermilion and often corrugated. Submucous haemorrhages are usually present, but perforation is rare. The rest of the alimentary canal exhibits inflammatory changes in a somewhat lesser degree. After chronic poisoning a widely spread fatty degeneration is present. Arsenic is found in almost every part of the body, but is retained in largest amount by the liver, secondly by the kidneys. After death from chronic poisoning it is found present even in the brain and spongy bone. The detection of arsenic in criminal cases is effected either by Reinsch's test or by Marsh's test, the urine being the secretion analysed when available. But Reinsch's test cannot be used satisfactorily for a quantitative determination, nor can it be used in the presence of chlorates or nitrates. And Marsh's test is very unmanageable with organic liquids on account of the uncontrollable frothing that takes place. But in such cases the organic matter can be first destroyed by one of the various methods, usually the moist method devised by Fresenius being chosen.

ARSENIUS (*c.* 354-450), an anchorite, said to have been born of a noble Roman family, who achieved a high reputation for his knowledge of Greek and Roman literature. He was appointed by Theodosius the Great, tutor of the young princes Arcadius and Honorius, but at the age of forty he retired to Egypt, where for forty years he lived in monastic seclusion at Scetis in the Thebais, under the spiritual guidance of St John the Dwarf. He is said to have gained the admiration of his fellows by the extreme rigour of his asceticism. The remainder of his life he spent at Canopus, and Troë near Memphis, where he died at the age of ninety-five. Of his writings two collections of admonitory maxims are extant: the first, Διδασκαλία καὶ παραίνεσις, containing instructions for monks, is published with a Latin version by Fr. Combefis in *Auctarium biblioth. patr. novissim.* (Paris, 1672), pp. 301 f.; the second is a collection of forty-four wise sayings put together by his friends under the title of Ἀποφθέγματα (see Cotelerius, *Eccl. graec. monum.*, 1677, i. pp. 353-372). In the Roman Catholic Church his festival is on the 19th of July, in the Orthodox Eastern Church on the 8th of May. His biography by Simeon Metaphrastes is largely fiction.

ARSENIUS AUTORIANUS (13th century), patriarch of Constantinople, lived about the middle of the 13th century. He received his education in Nicaea at a monastery of which he later became the abbot, though not in orders. Subsequently he gave himself up to a life of solitary asceticism in a Bithynian monastery, and is said, probably wrongly, to have remained some time in a monastery on Mount Athos. From this seclusion he was in A.D. 1255 called by Theodore II. Lascaris to the position of patriarch

at Nicaea, and four years later, on that emperor's death, became joint guardian of his son John. His fellow-guardian Georgios Mouzalon was immediately murdered by Michael Palaeologus, who assumed the position of tutor. Arsenius then took refuge in the monastery of Paschasius, retaining his office of patriarch but refusing to discharge its duties. Nicephorus of Ephesus was appointed in his stead. In 1261 Michael, having recovered Constantinople, induced Arsenius again to undertake the office of patriarch, but soon incurred his severe censure by ordering the young prince John to be blinded. Arsenius went so far as to excommunicate the emperor, who, having vainly sought for pardon, took refuge in false accusations against Arsenius and caused him to be banished to Proconnesus, where some years afterwards (according to Fabricius in 1264; others say in 1273) he died. Throughout these years he declined to remove the sentence of excommunication which he had passed upon Michael, and after his death, when the new patriarch Josephus gave absolution to the emperor, the quarrel was carried on between the "Arsenites" and the "Josephists." The "Arsenian schism" lasted till 1315, when reconciliation was effected by the patriarch Niphon (see Gibbon, *Decline and Fall of the Roman Empire*, ed. J.B. Bury, 1898, vol. vi. 467 foll.). Arsenius is said to have prepared from the decisions of the councils and the works of the Fathers a summary of divine laws under the title *Synopsis Canonum*. This was published (Greek original and Latin version) by G. Voël and H. Justel in *Bibliotheca Jur. Canon. Vet.* (Paris, 1661), 749 foll. Some hold that the *Synopsis* was the work of another Arsenius, a monk of Athos (see L. Petit in Vacant's *Dict. théol. cathol.* i. col. 1994); the ascription depends on whether the patriarch Arsenius did or did not sojourn at Mount Athos.

See Georgius Pachymeres ii. 15, iii. *passim*, iv. 1-16; Nicephorus Gregoras iii. 1, iv. 1; for the will of Arsenius see Cotelerius, *Monumenta*, ii. 168.

ARSES, Persian king, youngest son of Artaxerxes III., was raised to the throne in 338 B.C. by Bagoas (*q.v.*), who had murdered his father and all his brothers. But when the young king tried to make himself independent, Bagoas killed him too, with all his children, in the third year of his reign (336) (Diod. 17.5; Strabo 15. 736; Trogus, Prol. x., Alexander's despatch to Darius III.; Arrian ii. 14. 5, and the chronographers). In Plutarch, *De fort. Alex.* ii. 3. 5, he is called *Oarses*; in Johannes Antioch. p. 38, *Arsamos*; in the canon of Ptolemy, *Aroges* (by Elias of Nisibis, *Pīrūz*); in a chronological tablet from Babylon (Brit. Mus. Sp. ii. 71, *Zeitschrift für Assyriologie*, viii. 176, x. 64) he is abbreviated into *Ar*. See PERSIA: *Ancient History*.

(ED. M.)

ARSINOË, the name of four Egyptian princesses of the Ptolemaic dynasty. The name was introduced into the Ptolemaic dynasty by the mother of Ptolemy I. This Arsinoë was originally a mistress of Philip II. of Macedon, who presented her to a Macedonian soldier Loqus shortly before

Ptolemy was born. It was, therefore, assumed by the Macedonians that the Ptolemaic house was really descended from Philip (see PTOLEMIES).

1. Daughter of Lysimachus, king of Thrace, first wife of Ptolemy II. Philadelphus (285-247 B.C.). Accused of conspiring against her husband, who perhaps already contemplated marriage with his sister, also named Arsinoë, she was banished to Coptos, in Upper Egypt. Her son Ptolemy was afterwards king under the title of Euergetes. It is supposed by some (*e.g.* Niebuhr, *Kleine Schriften*; cf. Ehrlichs, *De Callimachi hymnis*) that she is to be identified with the Arsinoë who became wife of Magas, king of Cyrene, and that she married him after her exile to Coptos. But this hypothesis is apparently without foundation. Magas before his death had betrothed his daughter Berenice to the son of his brother Ptolemy II. Philadelphus, but Arsinoë, disliking the projected alliance, induced Demetrius the Fair, son of Demetrius Poliorcetes, to accept the throne of Cyrene as husband of Berenice. She herself, however, fell in love with the young prince, and Berenice in revenge formed a conspiracy, and, having slain Demetrius, married Ptolemy's son (see BERENICE, 3).

2. Daughter of Ptolemy I. Soter and Berenice. Born about 316 B.C., she married Lysimachus, king of Thrace, who made over to her the territories of his divorced wife, Amastris. To secure the succession for her own children she brought about the murder of her stepson Agathocles. Lysandra, the wife of Agathocles, took refuge with Seleucus, king of Syria, who made war upon Lysimachus and defeated him (281). After her husband's death Arsinoë fled to Ephesus and afterwards to Cassandreia in Macedonia. Seleucus, who had seized Lysimachus's kingdom, was murdered in 281 by Ptolemy Ceraunus (half-brother of Arsinoë), who thus became master of Thrace and Macedonia. To obtain possession of Cassandreia, he offered his hand in marriage to Arsinoë, and being admitted into the town, killed her two younger sons and banished her to Samothrace. Escaping to Egypt, she

became the wife of her full brother Ptolemy II., the first instance of the practice (afterwards common) of the Greek kings of Egypt marrying their sisters. She was a woman of a masterful character and won great influence. Her husband, though she bore him no children, was devoted to her and paid her all possible honour after her death in 271. He gave her name to a number of cities, and also to a district (nome) of Egypt.[1] It is related that he ordered the architect Dinochares to build a temple in her honour in Alexandria; in order that her statue, made of iron, might appear to be suspended in the air, the roof was to consist of an arch of loadstones (Pliny, *Hist. Nat.* xxxiv. 42). Coins were also struck, showing her crowned and veiled on the obverse, with a double cornucopia on the reverse. She was worshipped as a goddess under the title of Θεὰ φιλάδελφος, and she and her husband as Θεοὶ ἄδελφοι (Justin xxiv. 2, 3; Pausanias i. 7).

See von Prott, *Rhein. Mus.* liii. (1898), pp. 460 f.

3. Daughter of Ptolemy III. Euergetes, sister and wife of Ptolemy IV. Philopator. She seems to be erroneously called Eurydice by Justin (xxx. 2), and Cleopatra by Livy (xxvii. 4). Her presence greatly encouraged the troops at the battle of Raphia (217), in which Antiochus the Great was defeated. Her husband put her to death to please his mistress Agathocleia, a Samian dancer (between 210 and 205). She was worshipped as Θεὰ φιλοπάτωρ; she and her husband as Θεοὶ φιλοπάτορες (Polybius v. 83, 84, xv. 25-33).

4. Youngest daughter of Ptolemy XIII. Auletes, and sister of the famous Cleopatra. During the siege of Alexandria by Julius Caesar (48) she was recognized as queen by the inhabitants, her brother, the young Ptolemy, being then held captive by Caesar. Caesar took her with him to Rome as a precaution. After Caesar’s triumph she was allowed to return to Alexandria. After the battle of Philippi she was put to death at Miletus (or in the temple of Artemis at Ephesus) by order of Mark Antony, at the request of her sister

Cleopatra (Dio Cassius xlii. 39; Caesar, *Bell. civ.* iii. 112; Appian, *Bell. civ.* v. 9).

AUTHORITIES.—For general authorities see article PTOLEMIES. The article "Arsinoë" in Pauly-Wissowa's *Realencyclopädie* contains a full list of those who bore the name, and also of the numerous towns which were called after the various princesses.

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1 The appendix to pt. ii. of the Tebtunis series of papyri (Grenfell, Hunt and Goodspeed, 1907) contains a lengthy account of the topography of the Arsinoite nome.

ARSINOITHERIUM (so called from the Egyptian queen Arsinoë), a gigantic horned mammal from the Middle Eocene beds of the Fayum, Egypt, representing a sub-order of Ungulata, called Barypoda. The skull is remarkable for carrying a huge pair of horn-cores above the muzzle, which seem to be the enlarged nasal bones, and a rudimentary pair farther back; the front horn-cores, like the rest of the skull, consist of a mere shell of bone, and were probably clothed in life with horny sheaths. The teeth form a continuous even series, the small canines being crowded between the incisors and premolars; the crowns of the cheek-series are tall (hypsodont), with a distinctive pattern of their own. Although the brain is relatively larger, the bones of the limbs, especially the short, five-toed feet, approximate to those of the Amblypoda and Proboscidea; but in the articulation of the astragalus with both the navicular and cuboid *Arsinoitherium* is nearer the former than the latter group.

It is probable, however, that these resemblances are mainly due to parallelism in development, and are in all three cases adaptations necessary to support the enormous weight of the body. On the other hand, the marked resemblance of the structure of the tarsus is probably indicative of descent from nearly allied condylarthrous ancestors (see PHENACODUS). No importance can be attached to the presence of horns as an indication of affinity between *Arsinoitherium* and the Amblypoda; and there are important differences in the structure of the skulls of the two, notably in the external auditory meatus, the occiput, the premaxillae, the palatal foramina and the lower jaw.

From the Proboscidea *Arsinoitherium* differs broadly in skull structure, in the form of the cheek-teeth, and in the persistence of the complete dental series of forty-four without gaps or enlargement of particular teeth. Whether there is any relationship with the Hyracoidea cannot be determined until we are acquainted with the forerunners of *Arsinoitherium*, which is evidently a highly specialized type.

It may be added that as the name Barypoda has been used at an earlier date for another group of animals, the alternative title Embrithopoda has been suggested in case the former should be considered barred.

See C.W. Andrews, *Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, British Museum* (1906).

(R. L.*)

ARSON (from Lat. *ardere*, to burn), a crime which has been described as the malicious and voluntary burning of the house of another (3 Co. *Inst.* 66). At common law in England it is an offence of the degree of felony. In the Roman civil law arson was punishable by death. It appears early in the history of English law, being known in ancient laws by the term of *boernet*. It is mentioned by Cnut as one of the bootless crimes, and under the Saxon laws was punishable by death. The sentence of death for arson was, says Stephen (*Commentaries*, iv. 89), in the reign of Edward I. executed by a kind of *lex talionis*, for the incendiaries were burnt to death; a punishment which was inflicted also under the Gothic institutions. Death continued to be the penalty at least down to the reign of King John, according to a reported case (Gloucester Pleas, pl. 216), but in course of time the penalty became that of other common-law felonies, death by the gallows. It is one of the earliest crimes in which the *mens rea*, or criminal intent, was taken special notice of. Bracton deals at length with the *mala conscientia*, which he says is necessary for this crime, and contrasts it with *negligentia* (f. 146 b), while in many early indictments malice aforethought (*malitia praecogitata*) appears. Arson was deprived of "benefit of clergy" under the Tudors, while an act of 8 Henry VI. c. 6 (1429) made the wilful burning of houses, under particular circumstances, high treason, but acts of 1 Ed. VI. c. 12 (1547) and 1 Mary (1553) reduced it to an ordinary felony. The English law concerning arson was consolidated by 7 & 8 Geo. IV. c. 30, which was repealed and re-enacted by the Malicious Damage Act 1861.

The common-law offence of arson (which has been greatly enlarged by the act of 1861) required some part of the house to be actually burnt; neither a bare intention nor even an actual attempt by putting fire in or towards it will constitute the offence, if no part was actually burnt, but the burning of any part, however trifling, is sufficient, and the offence is complete even if the fire is put out or goes out of itself. The burning must be malicious and wilful, otherwise it is only a trespass. If a man by wilfully setting fire to his

own house burn the house of his neighbour also, it will be a felony, even though the primary intention of the party was to burn his own house only. The word *house*, in the definition of the offence at common law, extends not only to dwelling-houses, "but to all out-houses which are parcel thereof, though not adjoining thereto." Barns with corn and hay in them, though distant from a house, are within the definition.

The different varieties of the offence are specified in the Malicious Damage Act 1861. The following crimes are thereby made felonies: (1) setting fire to any church, chapel, meeting-house or other place of divine worship; (2) setting fire to a dwelling-house, any person being therein; (3) setting fire to a house, out-house, manufactory, farm-building, &c., with intent to impose and defraud any person; (4) setting fire to buildings appertaining to any railway, port, dock or harbour; or (5) setting fire to any public building. In these cases the act provides that the person convicted shall be liable, at the discretion of the court, to be kept in penal servitude for life, or for any term not less than three years (altered to *five* years by the Penal Servitude Acts Amendment Act 1864), or to be imprisoned for any time not exceeding two years, with or without hard labour, and, if a male under sixteen years of age, with or without whipping. Setting fire to other buildings, and setting fire to goods in buildings under such circumstances that, if the building were thereby set fire to, the offence would amount to felony, are subject to the punishments last enumerated, with this exception that the period of penal servitude is limited to fourteen years. The attempt to set fire to any building, or any matter or thing not enumerated above, is punishable as a felony. Russell says (*Crimes*, p. 1781) that the term building is no doubt very indefinite, but it was used in 9 & 10 Vict. c. 25, s. 2; and it was thought much better to adopt this term and leave it to be interpreted as each case might arise, than to attempt to define; as any such attempt would probably have failed in producing any expression more certain than the term "building" itself. In *R.* v. *Manning*, 1872 (L.R. 1 C.C.R. 338), it was

held that an unfinished house was a building within the meaning of the act. The setting fire to crops of hay, grass, corn, &c., is punishable by penal servitude for any period not exceeding fourteen years, but setting fire to stacks of the same, or any cultivated vegetable produce, or to peat, coals, &c., is regarded as a more serious offence, and the penal servitude may be for life. For the attempt to commit the last two offences penal servitude is limited to seven years. Setting fire to mines of coal, anthracite or other mineral fuel is visited with the full measure of penalty, and in the case of an attempt the penal servitude is limited to fourteen years. By the Dockyards, &c., Protection Act 1772 it is a felony punishable by death wilfully and maliciously to set fire to any of His Majesty's ships or vessels of war, or any of His Majesty's arsenals, magazines, dockyards, rope-yards, victualling offices or buildings therein, or any timber, material, stores or ammunition of war therein or in any part of His Majesty's dominions. If the person guilty of the offence is a person subject to naval discipline, he is triable by court-martial, and if found guilty, a sentence of capital punishment may be passed. The Malicious Damage Act 1861, s. 43, also includes as a felony the setting fire to any ship or vessel, with intent to prejudice any owner or part owner of the vessel, or of any goods on the same, or any person who has underwritten any policy of insurance on the vessel, or upon any goods on board the same.

In Scotland the offence equivalent to arson in England is known by the more expressive name of fire-raising. The crime was punishable capitally by old consuetudinary law, but it is now no longer capital, and may be tried in the sheriff court (50 & 51 Vict. c. 35, s. 56). Formerly the public prosecutor had the privilege of declining to demand capital punishment, and he invariably did so. *Wilful fire-raising*, which is the most heinous form of the crime, requires the raising of fire, without any lawful object, but with the deliberate intention of destroying certain premises or things, whether directly by the application of fire thereto, or indirectly by its application to

something contained in or forming part of or communicating with them; also the intention to destroy premises or things of a certain description (much as mentioned above); and such premises or things must be the property of another than the accused. *Wicked, culpable and reckless fire-raising* differs from wilful fire-raising in that the fire is raised *without* the deliberate intention of destroying premises or things, but while the accused was engaged in some unlawful act, or while he was in such a state of passion, excitement or recklessness as not to care what results might follow from his acts.

United States.—The same general principles apply to this crime in American law. In some states by statute the intent to injure or defraud must be shown, *e.g.* when the property is insured. In New York one who wilfully burns property (including a vessel or its cargo) with intent to defraud or prejudice the insurer thereof, though the offence of arson is not committed, is punishable by imprisonment for not more than five years (N.Y. Pen. Code, ss. 575, 578). There must be an intent to destroy the building (*ibid.* s. 490; California Code, s. 447). An agreement to commit arson is conspiracy (*ibid.* s. 171). Killing a person in committing the crime of arson is murder in the first degree (*ibid.* s. 183); this is so in California, even where the crime is merely an attempt to commit arson (Cal. Pen. Code, s. 189). Explosion of a house by gunpowder or dynamite is arson (Texas Pen. Code, art. 761), but a charge of arson by "burning" will not be sustained by proof of exploding by dynamite, even though part of the building is burnt by the explosion (*Landers* v. *State* [Tex.], 47 S.W. 1008).

AUTHORITIES.—W.S. Holdsworth, *History of English Law*, vol. iii.; Pollock and Maitland, *History of English Law*; Stephen, *History of Criminal Law*, vol. iii.; Stephen, *Commentaries*; Russell on *Crimes*.

ARSONVAL, a village of France in the department of Aube, lies on the right bank of the Aube, about 30 m. east of Troyes. It has a church dating from the 12th century. Pop. 434.

ARSOT, the name of a forest in France, in the immediate neighbourhood of Belfort. It has an area of about 1500 acres, is almost encircled by a small stream, the Eloie, and is about 1400 ft. above the sea. On the east it is continued by the forest of Denney, which contains the fortress of Roppe, dominating the road from Colmar into France.

ARSUF, a town on the coast of Palestine, 12 m. N.N.E. of Jaffa, famous as the scene of a victory of the crusaders under Richard I. of England over the army of Saladin. After the capture of Acre on the 12th of July 1191, the army of the crusaders, under Richard Cœur-de-Lion and the duke of Burgundy, opened their campaign for the recovery of Jerusalem by marching southward towards Jaffa, from which place it was intended to move direct upon the holy city. The march was along the sea-shore, and, the forces of Saladin being in the vicinity, the army moved in such a formation as to be able to give battle at any moment. Richard thus moved slowly, but in such compact order as to arouse the admiration even of the enemy. The right column of baggage and supplies, guarded by infantry, was nearest the

sea, the various corps of heavy cavalry, one behind the other, formed the central column, and on the exposed left flank was the infantry, well closed up, and "level and firm as a wall," according to the testimony of Saracen authors. The columns were united into a narrow rectangle by the advanced and rear guards. The whole march was a running fight between untiring horse-archers and steady infantry. Only once did the column open out, and the opportunity was swiftly seized by the Saracens, yet so rapid was the rally of the crusaders that little damage was done (August 25). The latter maintained for many days an absolutely passive defence, and could not be tempted to fight; Richard and his knights made occasional charges, but quickly withdrew, and on the 7th of September this irregular skirmishing, in which the crusaders had scarcely suffered at all, culminated in the battle of Arsuf. Saladin had by now decided that the only hope of success lay in compelling the rear of the Christians' column to halt—and thus opening a gap, should the van be still on the move. Richard, on the other hand, had prepared for action by closing up still more, and as the crusaders were now formed a simple left turn brought them into two lines of battle, infantry in first line, cavalry in second line. Near Arsuf the road entered a defile between the sea and a wooded range of hills; and from the latter the whole Moslem army suddenly burst forth. The weight of the attack fell upon the rear of Richard's column, as Saladin desired. The column slowly continued its march, suffering heavily in horses, but otherwise unharmed. The first assault thus made no impression, but a fierce hand-to-hand combat followed, in which the Hospitallers, who formed the rear of the Christian army, were hard pressed. Their grand master, like many other subordinates in history, repeatedly begged to be allowed to charge, but Richard, who on this occasion showed the highest gift of generalship, that of feeling the pulse of the fight, waited for the favourable moment. Almost as he gave the signal for the whole line to charge, the sorely pressed Hospitallers rode out upon the enemy on their own initiative. At once the whole of the cavalry

followed suit. The head (or right wing) and centre were not closely engaged, and their fleeter opponents had time to ride off, but the rear of the column carried all before it in its impetuous onset, and cut down the Saracens in great numbers. A second charge, followed by a third, dispersed the enemy in all directions. The total loss of the Saracens was more than tenfold that of the Christians, who lost but seven hundred men. The army arrived at Jaffa on the 10th of September.

See Oman, *Hist. of the Art of War*, ii. 303-317.

ARSURE, a village of France in the department of Jura, has some stone quarries and extensive layers of peat in its neighbourhood. Its church has a choir dating from the 11th century. Pop. 370.

ARSURES, a village of France in the department of Jura, situated on a small stream, the Lurine. It is surrounded by vineyards, from which excellent wine is produced. Pop. 233.

ART, a word in its most extended and most popular sense meaning everything which we distinguish from Nature. Art and Nature are the two most comprehensive genera of which the human mind has formed the conception. Under the genus Nature, or the genus Art, we include all the phenomena of the universe. But as our conception of Nature is indeterminate and variable, so in some degree is our conception of Art. Nor does such ambiguity arise only because some modes of thought refer a greater number of the phenomena of the universe to the genus Nature, and others a greater number to the genus Art. It arises also because we do not strictly limit the one genus by the other. The range of the phenomena to which we point, when we say Art, is never very exactly determined by the range of the other phenomena which at the same time we tacitly refer to the order of Nature. Everybody understands the general meaning of a phrase like Chaucer's "Nature ne Art ne koude him not amende," or Pope's "Blest with each grace of nature and of art." In such phrases we intend to designate familiarly as Nature all which exists independently of our study, forethought and exertion—in other words, those phenomena in ourselves or the world which we do not originate but find; and we intend to designate familiarly as Art all which we do not find but originate—or, in other words, the phenomena, which we add by study, forethought and exertion to those existing independently of us. But we do not use these designations consistently. Sometimes we draw an arbitrary line in the action of individuals and societies, and say, Here Nature ends and Art begins—such a law, such a practice, such an industry even, is natural, and such another is artificial; calling those natural which happen spontaneously and without much reflection, and the others artificial. But this line different observers draw at different places. Sometimes we adopt views which waive the distinction altogether. One such view is that wherein all phenomena are regarded as equally natural, and the idea of Nature is extended so as to include "all the powers existing in either the outer or the inner world, and

everything which exists by means of those powers." In this view Art becomes a part of Nature. It is illustrated in the familiar passage of Shakespeare, where Polixenes reminds Perdita that

> "Nature is made better by no mean,
> But nature makes that mean: so, over that art
> Which, you say, adds to nature, is an art
> That nature makes." ...
> "This is an art
> Which does mend nature, change it rather, but
> The art itself is nature."

A posthumous essay of John Stuart Mill contains a full philosophical exposition and defence of this mode of regarding the relations of Nature and Art. Defining Nature as above, and again as a "collective name for all facts, actual and possible," that writer proceeds to say that such a definition

> "is evidently inapplicable to some of the modes in which the word is familiarly employed. For example, it entirely conflicts with the common form of speech by which Nature is opposed to Art, and natural to artificial. For in the sense of the word Nature which has thus been defined, and which is the true scientific sense, Art is as much Nature as anything else; and everything which is artificial is natural—Art has no independent powers of its own: Art is but the employment of the powers of Nature for an end. Phenomena produced by human agency no less than those which, as far as we are concerned, are spontaneous, depend on the properties of the elementary forces, or of the elementary substances and their compounds. The united powers of the whole human race could not create a new property of matter in general, or of any one of its species. We can only take advantage for our purposes of

the properties we find. A ship floats by the same laws of specific gravity and equilibrium as a tree uprooted by the wind and blown into the water. The corn which men raise for food grows and produces its grain by the same laws of vegetation by which the wild rose and the mountain strawberry bring forth their flowers and fruit. A house stands and holds together by the natural properties, the weight and cohesion of the materials which compose it. A steam engine works by the natural expansive force of steam, exerting a pressure upon one part of a system of arrangements, which pressure, by the mechanical properties of the lever, is transferred from that to another part, where it raises the weight or removes the obstacle brought into connexion with it. In these and all other artificial operations the office of man is, as has often been remarked, a very limited one; it consists of moving things into certain places. We move objects, and by doing this, bring some things into contact which were separate, or separate others which were in contact; and by this simple change of place, natural forces previously dormant are called into action, and produce the desired effect. Even the volition which designs, the intelligence which contrives, and the muscular force which executes these movements, are themselves powers of Nature."

Another mode of thought, in some sort complementary to the last, is based on the analogy which the operations of forces external to a man bear to the operations of man himself. Study, forethought and exertion are assigned to Nature, and her operations are called operations of Art. This view was familiar to ancient systems of philosophy, and especially to that of the Stoics. According to the report of Cicero, Nature as conceived by Zeno was a fire, and at the same time a voluntary agent having the power or art of creating things with regularity and design ("naturam esse ignem artificiosum ad gignendum progredientem via"). To this fire not merely creative force and systematic action were ascribed, but actual personality. Nature was "non artificiosa solum, sed plane artifex." "That which in the

works of human art is done by hands, is done with much greater art by Nature, that is, by a fire which exercises an art and is the teacher of other arts." This conception of Nature as an all-generating fire, and at the same time as a personal artist both teaching and including in her own activity all the human arts, on the one hand may be said, with Polixenes and J.S. Mill, to merge Art in Nature; but on the other hand it finds the essence of Nature in the resemblance of her operations to those of Art. "It is the *proprium* of art," according to the same system, "to create and beget," and the reasoning proceeds—Nature creates and begets, therefore Nature is an artist or Demiurgus. A kindred view is set forth by Sir Thomas Browne in the *Religio Medici*, when he declares that "all things are artificial; for Nature is the Art of God."

But these modes of thought, according to which, on the one hand, the processes of Art are included among processes of Nature, or on the other the processes of Nature among the processes of Art, are exceptional. In ordinary use the two conceptions, each of them somewhat vague and inexact, are antithetical. Their antithesis was what Dr Johnson had chiefly in his mind when he defined Art as "the power of doing something which is not taught by Nature or by instinct." But this definition is insufficient, because the abstract word Art, whether used of all arts at once or of one at a time, is a name not only for the power of doing something, but for the exercise of the power; and not only for the exercise of the power, but for the rules according to which it is exercised; and not only for the rules, but for the result. Painting, for instance, is an art, and the word connotes not only the power to paint, but the act of painting; and not only the act, but the laws for performing the act rightly; and not only all these, but the material consequences of the act or the thing painted. So of agriculture, navigation and the rest. Exception might also be taken to Dr Johnson's definition on the ground that it excludes all actions of instinct from the genus Art, whereas usage has in more languages than one given the name of Art to

several of those ingenuities in the lower animals which popular theory at the same time declares to be instinctive. Dante, for instance, speaks of boughs shaken by the wind, but not so violently as to make the birds forgo their Art—

> "Non però dal lor esser dritto sparte
> Tanto, che gl' augelletti per le cime
> Lasciasser d' operar ogni lor *arte*."

And Fontenelle, speaking in the language not of poetry but of science: —"Most animals—as, for instance, bees, spiders and beavers—have a kind of art peculiar to themselves; but each race of animals has no more than one art, and this one has had no first inventor among the race. Man, on the other hand, has an infinity of different arts which were not born with his race, and of which the glory is his own." Dr Johnson might reply that those properties of variety and of originality or individual invention, which Fontenelle himself alleges in the ingenuities of man but not in those of the lower animals, are sufficient to make a generic difference, and to establish the impropriety of calling a honeycomb or a spider's web a work of Art. It is not our purpose to trespass on ground so debateable as that of the nature of consciousness in the lower animals. Enough that when we use the term Art of any action, it is because we are thinking of properties in the action from which we infer, whether justly or not, that the agent voluntarily and designedly puts forth skill for known ends and by regular and uniform methods. If, then, we were called upon to frame a general definition of Art, giving the word its widest and most comprehensive meaning, it would run thus:—*Every regulated operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the result of every such operation or dexterity*.

Here it will be well to consider very briefly the natural history of the name which has been given to this very comprehensive conception by the principal branches of civilized mankind. Our own word Art the English language has taken, as all the Romance languages of modern Europe have taken theirs, directly from the Latin. The Latin *ars*, according to the prevailing opinion of philologists, proceeds from a root AR, of which the primitive signification was to put or fit things together, and which is to be found in a large family of Greek words. The Greek τέχνη, the name both for arts in the particular and art in the abstract, is by its root related both to τέκ-των and τέκ-νον, and thus contains the allied ideas of making and begetting. The *proprium* of art in the logic of the Stoics, "to create and beget," was strictly in accordance with this etymology. The Teutonic *Kunst* is formed from *können*, and *können* is developed from a primitive *Ich kann*. In *kann* philology is inclined to recognize a preterite form of a lost verb, of which we find the traces in *Kin-d*, a child; and the form *Ich kann* thus meaning originally "I begot," contains the germ of the two several developments,—*können*, "to be master," "to be able," and *kennen*, "to know." We thus see that the chief Indo-European languages have with one consent extended a name for the most elementary exercise of a constructive or productive power, till that name has covered the whole range of the skilled and deliberate operations of sentient beings.

In proportion as men left out of sight the idea of creation, of constructing or producing, "artificiosum esse ad gignendum," which is the primitive half of this extended notion, and attended only to the idea of skill, of proceeding by regular and disciplined methods, "progredi via," which is the superadded half, the whole notion Art, and the name for it, might become subject to a process of thought which, if analysed, would be like this:—What is done by regular and disciplined methods is Art; facts are observed and classified, and a systematic view of the order of the universe obtained, by regular and disciplined methods; the observing and classifying of facts, and obtaining a

systematic view of the order of the universe, is therefore Art. To a partial extent this did unconsciously take place. Science, of which the essence is only in knowledge and theory, came to be spoken of as Art, of which the essence is all in practice and production. Cicero, notwithstanding his citation of the Stoical dictum that practice and production were of the essence of Art, elsewhere divides Art into two kinds—one by which things are only contemplated in the mind, another by which something is produced and done. ("Quumque artium aliud eiusmodi sit, ut tantummodo rem cernat; aliud, ut moliatur aliquid et faciat."—*Acad*. ii. 7.) Of the former kind his instance is geometry; of the latter the art of playing on the lyre. Now geometry, understanding by geometry an acquisition of the mind, that is, a collected body of observations and deductions concerning the properties of space and magnitude, is a science and not an art; although there is an art of the geometer, which is the skill by which he solves any given problem in his science, and the rules of that skill, and his exertion in putting it forth. And so every science has its instrumental art or practical discipline; and in as far as the word Art is used only of the practical discipline or dexterity of the geometer, the astronomer, the logician, the grammarian, or other person whose business it is to collect and classify facts for contemplation, in so far the usage is just. The same justification may be extended to another usage, whereby in Latin, and some of its derivative languages, the name Art came to be transferred in a concrete sense to the body of rules, the written code or manual, which lays down the discipline and regulates the dexterity; as *ars grammatica, ars logica, ars rhetorica* and the rest. But when the word is stretched so as to mean the sciences, as theoretical acquisitions of the mind, that meaning is illegitimate. Whether or not Cicero, in the passage above quoted, had in his mind the science of geometry as a collected body of observations and deductions, it is certain that the Ciceronian phrase of the *liberal arts*, the *ingenuous arts*, both in Latin and its derivatives or translations in modern speech, has been used currently to denote the

sciences themselves, and not merely the disciplines instrumental to them. The *trivium* and the *quadrivium* (grammar, logic and rhetoric—geometry, astronomy, music and arithmetic) have been habitually called arts, when some of them have been named in that sense in which they mean not arts but sciences, "only contemplating things in the mind." Hence the nomenclature, history and practical organization, especially in Britain, of one great division of university studies: the division of "arts," with its "faculty," its examinations, and its degrees.

In the German language the words for Art and Science have in general been loosely interchanged. The etymology of the word for Art secured a long continuance for this ambiguity. *Kunst* was employed indiscriminately in both the senses of the primitive *Ich kann*, to signify what I know, or Science, and what I can do, or Art. It was not till the end of the 17th century that a separate word for Science, the modern *Wissenschaft*, came into use. On the other hand, the Greek word τέχνη, with its distinct suggestion of the root signification to make or get, acted probably as a safeguard against this tendency. The distinction between τέχνη, Art or practice, and ἐπιστήμη, knowledge or Science, is observed, though not systematically, in Greek philosophy. But for our present purpose, that of making clear the true relation between the one conception and the other, further quotation is rendered superfluous by the discussion the subject has received at the hands of the modern writer already quoted. Between Art, of which we practise the rules, and Science, of which we entertain the doctrines, J.S. Mill establishes the difference in the simplest shape, by pointing out that one grammatical mood is proper for the conclusions of Science, and another for those of Art. Science enunciates her conclusions in the indicative mood, whereas "the imperative is the characteristic of Art, as distinguished from Science." And as Art utters her conclusions in her own form, so she supplies the substance of her own major premise.

"Every art has one first principle, or general major premise, not borrowed from science, that which enunciates the object aimed at, and affirms it to be a desirable object. The builder's art assumes that it is desirable to have buildings; architecture (as one of the fine arts) that it is desirable to have them beautiful and imposing. The hygienic and medical arts assume, the one that the preservation of health, the other that the cure of disease, are fitting and desirable ends. These are not propositions of science. Propositions of science assert a matter of fact —an existence, a co-existence, a succession, or a resemblance. The propositions now spoken of do not assert that anything is, but enjoin or recommend that something should be. They are a class by themselves. A proposition of which the predicate is expressed by the words *ought* or *should be* is generically different from one which is expressed by *is* or *will be*."

And the logical relation of Art and Science, in other words, the manner of framing the intermediate member between the general major premise of Art and its imperative conclusion, is thus defined:—

"The Art [in any given case] proposes to itself an end to be attained, defines the end, and hands it over to the Science. The Science receives it, considers it as a phenomenon or effect to be studied, and having investigated its causes and conditions, sends it back to Art with a theorem of the causes and combinations by which it could be produced. Art then examines these combinations of circumstances, and according as any of them are or are not in human power, pronounces the end attainable or not. The only one of the premises, therefore, which Art supplies, is the original major premise, which asserts that the attainment of the given end is desirable. Science, then, lends to Art the proposition (obtained by a series of inductions or deductions) that the performance of certain actions will attain the end. From these premises

> Art concludes that the performance of these actions is desirable, and finding it also practicable, converts the theorem into a rule or precept.... The grounds, then, of every rule of Art are to be found in the theorems of Science. An Art, or a body of Art, consists of the rules, together with as much of the speculative propositions as comprises the justification of these rules. The complete Art of any matter includes a selection of such a portion from the Science as is necessary to show on what conditions the effects, which the Art aims at producing, depend. And Art in general consists of the truths of Science arranged in the most convenient order for practice, instead of the order which is most convenient for thought. Science groups and arranges its truths so as to enable us to take in at one view as much as possible of the general order of the universe. Art, though it must assume the same general laws, follows them only into such of their detailed consequences as have led to the formation of rules of conduct, and brings together from parts of the field of Science most remote from one another, the truths relating to the production of the different and heterogeneous causes necessary to each effect which the exigencies of practical life require to be produced."—(Mill's *Logic*, vol. ii. pp. 542-549).

The whole discussion may be summed up thus. Science consists in knowing, Art consists in doing. What I must do in order to know, is Art subservient to Science: what I must know in order to do, is Science subservient to Art.

Art, then, is defined by two broad distinctions: first, its popular distinction from Nature; and next, its practical and theoretic distinction from Science. Both of these distinctions are observed in the terms of our definition given above. Within the proper limits of this definition, the conception of Art, and the use of the word for it, have undergone sundry variations. These variations correspond to certain vicissitudes or

developments in the order of historical facts and in society. The requirements of society, stimulating the ingenuity of its individual members, have led to the invention of arts and groups of arts, constantly progressing, with the progress of civilization, in number, in complexity, and in resource. The religious imagination of early societies, who find themselves in possession of such an art or group of arts, forgets the history of the invention, and assigns it to the inspiration or special grace of some god or hero. So the Greeks assigned the arts of agriculture to Triptolemus, those of spinning and navigation to Athena, and of music to Apollo. At one stage of civilization one art or group of arts is held in higher esteem, another at another. In societies, like most of those of the ancient world, where slaves were employed in domestic service, and upon the handicrafts supplying the immediate utilities of life—food, shelter and clothing—these constituted a group of servile arts. The arts of husbandry or agriculture, on the other hand, have alternately been regarded as servile and as honourable according as their exercise has been in the hands of a subject class, as under feudal institutions, or, as under the Roman republic, of free cultivators. Under feudal institutions, or in a society in a state of permanent war, the allied arts of war and of government have been held the only honourable class. In commercial states, like the republics of Italy, the arts of gain, or of production (other than agricultural) and distribution, have made good their title to equal estimation and greater power beside the art of captains. But among peaceful arts, industries or trades, some have always been held to be of higher and others of lower rank; the higher rank being assigned to those that required larger operations, higher training, or more thoughtful conduct, and yielded ampler returns—the lower rank to those which called for simple manual exercise, especially if such exercise was of a disagreeable or degrading kind. In the cities of Italy, where both commerce and manufactures were for the first time organized on a considerable scale, the name *arte*, Art, was retained to designate the gilds or corporations by which

the several industries were exercised; and, according to the nature of the industry, the art was classed as higher or lower (*maggiore* and *minore*).

The arts of which we have hitherto spoken have arisen from positive requirements, and supply what are strictly utilities, in societies; not excluding the art of war, at least so far as concerns one-half of war, the defensive half. But war continued to be an honourable pursuit, because it was a pursuit associated with birth, power and wealth, as well as with the virtue of courage, in cases where it had no longer the plea of utility, but was purely aggressive or predatory; and the arts of the chase have stood in this respect in an analogous position to those of war.

There are other arts which have not had their origin in positive practical needs, but have been practised from the first for pleasure or amusement. The most primitive human beings of whom we have any knowledge, the cave-dwellers of the palaeolithic period, had not only the useful art of chipping stones into spear-heads, knife-heads and arrow-heads, and making shafts or handles of these implements out of bone; they had also the ornamental art of scratching upon the bone handle the outlines of the animals they saw—mammoth, rhinoceros or reindeer—or of carving such a handle into a rude resemblance of one of these animals. Here we have a skill exercised, in the first case, for pure fancy or pleasure, and in the second, for adding an element of fancy or pleasure to an element of utility. Here, therefore, is the germ of all those arts which produce imitations of natural objects for purposes of entertainment or delight, as painting, sculpture, and their subordinates; and of all those which fashion useful objects in one way rather than another because the one way gives pleasure and the other does not, as architecture and the subordinate decorative arts of furniture, pottery and the rest. Arts that work in a kindred way with different materials are those of dancing and music. Dancing works with the physical movements of human beings. Music works with sound. Between

that imitative and plastic group, and the group of these which only produce motion or sound and pass away, there is the intermediate group of eloquence and the drama, which deal with the expression of human feeling in spoken words and acted gestures. There is also the comprehensive art of poetry, which works with the material of written words, and can ideally represent the whole material of human life and experience. Of all these arts the end is not use but pleasure, or pleasure before use, or at least pleasure and use conjointly. In modern language, there has grown up a usage which has put them into a class by themselves under the name of the Fine Arts, as distinguished from the Useful or Mechanical Arts. (See AESTHETICS and FINE ARTS.) Nay more, to them alone is often appropriated the use of the generic word Art, as if they and they only were the arts κατ᾽ ἐξοχήν. And further yet, custom has reduced the number which the class-word is meant to include. When Art and the works of Art are now currently spoken of in this sense, not even music or poetry is frequently denoted, but only architecture, sculpture and painting by themselves, or with their subordinate and decorative branches. In correspondence with this usage, another usage has removed from the class of *arts*, and put into a contrasted class of *manufactures*, a large number of industries and their products, to which the generic term Art, according to our definition, properly applies. The definition covers the *mechanical* arts, which can be efficiently exercised by mere trained habit, rote or calculation, just as well as the fine arts, which have to be exercised by a higher order of powers. But the word Art, becoming appropriated to the fine arts, has been treated as if it necessarily carried along with it, and as if works to be called works of art must necessarily possess, the attributes of free individual skill and invention, expressing themselves in ever new combinations of pleasurable contrivance, and seeking perfection not as a means towards some ulterior practical end but as an ideal end in itself.

(S. C.)

ARTA (*Narda*, *i.e.* ἐν Ἄρδα, or *Zarta*, *i.e.* εἰς Ἄρτα), a town of Greece, in the province of Arta, 59 m. N.N.W. of Mesolonghi. Pop. about 7000. It is built on the site of the ancient Ambracia (*q.v.*), its present designation being derived from a corruption of the name of the river Arachthus (Arta) on which it stands. This enters the Gulf of Arta some distance south of the town. The river forms the frontier between Greece and Turkey, and is crossed by a picturesque bridge, which is neutral ground. There are a few remains of old cyclopean walls. The town contains also a Byzantine castle, built on the lofty site of the ancient citadel; a palace belonging to the Greek metropolitan; a number of mosques, synagogues and churches, the most remarkable being the church of the Virgin of Consolation, founded in 819. The streets of the town were widened and improved in 1869. Manufacture of woollens, cottons, Russia leather and embroidery is carried on, and there is trade in cattle, wine, tobacco, hemp, hides and grain. Much of the neighbouring plain is very fertile, and the town is surrounded with gardens and orchards, in which orange, lemon and citron come to great perfection. In 1083 Arta was taken by Bohemund of Tarentum; in 1449 by the Turks; in 1688 by the Venetians. In 1797 it was held by the French, but in the following year, 1798, Ali Pasha of Iannina captured it. During the Greek War of Independence it suffered severely, and was the scene of several conflicts, in which the ultimate success was with the Turks. An insurrection in 1854 was at once repressed. It was ceded to Greece in 1881. In the Greco-Turkish War of 1897 the Greeks gained some temporary successes at Arta during April and May.

ARTA, GULF OF (anc. *Sinus Ambracius*), an inlet of the Ionian Sea, 25 m. long and 10 broad, most of the northern shores of which belong to Turkey, the southern and eastern to Greece. Its only important affluent, besides the Arta, is the Luro (anc. *Charadra*), also from the north. The gulf abounds with mullets, soles and eels. Around its shores are numerous ruins of ancient cities: Actium at the entrance, where the famous battle was fought in 31 B.C.; Nicopolis, Argos, Limnaea and Olpae; and several flourishing towns, such as Preveza, Arta (anc. *Ambracia*), Karavasara or Karbasaras, and Vonitza.

The river ARTA (anc. *Arachthus* or *Aratthus*, in Livy xxxviii. 3, *Aretho*) is the chief river of Epirus, and is said to have been navigable in ancient times as far as Ambracia. Below this town it flows through a marshy plain, consisting mainly of its own alluvium; its upper course is through the territory of the Molossians; its total length is about 80 m.

ARTABANUS, the name of a number of Persian princes, soldiers and administrators. The most important are the following:—

1. Brother of Darius I., and, according to Herodotus, the trusted adviser of his nephew Xerxes. Herodotus makes him a principal figure in epic dialogues: he warns Darius not to attack the Scythians (iv. 83; cf. also iv. 143), and predicts to Xerxes his defeat by the Greeks (vii. 10 ff., 46 ff.); Xerxes sent him home to govern the empire during the campaign (vii. 52, 53).

2. Vizier of Xerxes (Ctesias, *Pers*. 20), whom he murdered in 465 B.C. According to Aristotle, *Pol*. v. 1311 b, he had previously killed Xerxes' son Darius, and was afraid that the father would avenge him; according to Ctesias, *Pers*. 29, Justin iii. 1, Diod. xi. 69, he killed Xerxes first and then pretended that Darius had murdered him, and instigated his brother Artaxerxes to avenge the parricide. At all events, during the first months of the reign of Artaxerxes I., he was the ruling power in the state (therefore the chronographers wrongly reckon him as king, with a reign of seven months), until Artaxerxes, having learned the truth about the murder of his father and his brother, overwhelmed and killed Artabanus and his sons in open fight.

3. A satrap of Bactria, who revolted against Artaxerxes I., but was defeated in two battles (Ctes. *Pers*. 31).

The name was borne also by four Parthian kings. The Parthian king Arsaces, who was attacked by Antiochus III. in 209, has been called Artabanus by some modern authors without any reason.

4. ARTABANUS I., successor of his nephew Phraates II. about 127 B.C., perished in a battle against the Tochari, a Mongolian tribe, which had invaded the east of Iran (Justin xli. 2). He is perhaps identical with the Artabanus mentioned in Trogus, Prol. xlii.

5. ARTABANUS II. *c*. A.D. 10-40, son of an Arsacid princess (Tac. *Ann*. vi. 48), lived in the East among the Dahan nomads. He was raised to the throne by those Parthian grandees who would not acknowledge Vonones I., whom Augustus had sent from Rome (where he lived as hostage) as successor of his father Phraates IV. The war between the two pretenders was long and doubtful; on a coin Vonones mentions a victory over Artabanus. At last Artabanus defeated his rival completely and occupied Ctesiphon; Vonones fled to Armenia, where he was acknowledged as king, under the protection of the Romans. But when Artabanus invaded Armenia, Vonones fled to

Syria, and the emperor Tiberius thought it prudent to support him no longer. Germanicus, whom he sent to the East, concluded a treaty with Artabanus, in which he was recognized as king and friend of the Romans. Armenia was given (A.D. 18) to Zeno, the son of the king of Pontus (Tac. *Ann*. ii. 3 f., 58; Joseph. *Ant*. 18. 24).

Artabanus II., like all Parthian princes, was much troubled by the opposition of the grandees. He is said to have been very cruel in consequence of his education among the Dahan barbarians (Tac. *Ann*. vi. 41). To strengthen his power he killed all the Arsacid princes whom he could reach (Tac. *Ann*. vi. 31). Rebellions of the subject nations may have occurred also. We learn that he intervened in the Greek city Seleucia in favour of the oligarchs (Tac. *Ann*. vi. 48), and that two Jewish brigands maintained themselves for years in Neerda in the swamps of Babylonia, and were acknowledged as dynasts by Artabanus (Jos. *Ant.* 18. 9). In A.D. 35 he tried anew to conquer Armenia, and to establish his son Arsaces as king there. A war with Rome seemed inevitable. But that party among the Parthian magnates which was hostile to Artabanus applied to Tiberius for a king of the race of Phraates. Tiberius sent Phraates's grandson, Tiridates III., and ordered L. Vitellius (the father of the emperor) to restore the Roman authority in the East. By very dexterous military and diplomatic operations Vitellius succeeded completely. Artabanus was deserted by his followers and fled to the East. Tiridates, who was proclaimed king, could no longer maintain himself, because he appeared to be a vassal of the Romans; Artabanus returned from Hyrcania with a strong army of Scythian (Dahan) auxiliaries, and was again acknowledged by the Parthians. Tiridates left Seleucia and fled to Syria. But Artabanus was not strong enough for a war with Rome; he therefore concluded a treaty with Vitellius, in which he gave up all further pretensions (A.D. 37). A short time afterwards Artabanus was deposed again, and a certain Cinnamus was proclaimed king. Artabanus took refuge with his vassal, the king Izates, of Adiabene; and Izates by

negotiations and the promise of a complete pardon induced the Parthians to restore Artabanus once more to the throne (Jos. *Ant.* 20. 3). Shortly afterwards Artabanus died, and was succeeded by his son, Vardanes, whose reign was still more turbulent than that of his father.

6. ARTABANUS III. reigned a short time in A.D. 80 (on a coin of this year he calls himself Arsaces Artabanus) and the following years, and supported a pretender who rose in Asia Minor under the name of Nero (Zonaras xi. 18), but could not maintain himself against Pacorus II.

7. ARTABANUS IV., the last Parthian king, younger son of Vologaeses IV., who died A.D. 209. He rebelled against his brother Vologaeses V. (Dio Cass. vii. 12), and soon obtained the upper hand, although Vologaeses V. maintained himself in a part of Babylonia till about A.D. 222. The emperor Caracalla, wishing to make use of this civil war for a conquest of the East in imitation of his idol, Alexander the Great, attacked the Parthians in 216. He crossed the Tigris, destroyed the towns and spoiled the tombs of Arbela; but when Artabanus advanced at the head of an army, he retired to Carrhae. There he was murdered by Macrinus in April 217. Macrinus was defeated at Nisibis and concluded a peace with Artabanus, in which he gave up all the Roman conquests, restored the booty, and paid a heavy contribution to the Parthians (Dio Cass. lxxviii. 26 f.). But at the same time, the Persian dynast Ardashir (*q.v.*) had already begun his conquests in Persia and Carmania. When Artabanus tried to subdue him his troops were defeated. The war lasted several years; at last Artabanus himself was vanquished and killed (A.D. 226), and the rule of the Arsacids came to an end.

See further PERSIA: History, § ancient, and works there quoted.

(ED. M.)

ART AND PART, a term used in Scots law to denote the aiding or abetting in the perpetration of a crime,—the being an accessory before or at the perpetration of the crime. There is no such offence recognized in Scotland as that of being an accessory after the fact.

ARTAPHERNES, more correctly ARTAPHRENES, brother of Darius Hystaspis, and satrap of Sardis. It was he who received the embassy from Athens sent probably by Cleisthenes (*q.v.*) in 507 B.C., and subsequently warned the Athenians to receive back the "tyrant" Hippias. Subsequently he took an important part in suppressing the Ionian revolt (see IONIA, ARISTAGORAS, HISTIAEUS), and after the war compelled the cities to make agreements by which all differences were to be settled by reference. He also measured out their territories in parasangs and assessed their tributes accordingly (Herod, vi. 42). In 492 he was superseded in his satrapy by Mardonius (Herodotus v. 25, 30-32, 35, &c.; Diod. Sic. x. 25). His son, of the same name, was appointed (490), together with Datis, to take command of the expedition sent by Darius to punish Athens and Eretria for their share in the Ionian revolt. After the defeat of Marathon he returned to Asia. In the expedition of Xerxes, ten years later, he was in command of the Lydians and Mysians (Herod, vi. 94, 119; vii. 74, Aesch. *Persae*, 21).

Aeschylus in his list of Persian kings (*Persae*, 775 ff.), which is quite unhistorical, mentions two kings with the name Artaphrenes, who may have been developed out of these two Persian commanders.

(ED. M.)

ARTAXERXES, a name representing Pers. *Artakhshatra*, "he whose empire is well-fitted" or "perfected", Heb. *Artakhshasta*, Bab. *Artakshatsu*, Susian *Irtakshashsha* (and variants), Gr. Ἀρταξέρξης, Ἀρτοξέρξης, and in an inscription of Tralles (Dittenberger, *Sylloge*, 573) Ἀρταξέσσης; Herodotus (vi. 98) gives the translation μέγας ἀρήιος, and considers the name as a compound of Xerxes, showing thereby that he knew nothing of the Persian language; the later Persian form is *Ardashir*, which occurs in the form Artaxias (Artaxes) as the name of some kings of Armenia. It was borne by three kings of the Achaemenian dynasty of ancient Persia; though, so long as its meaning was understood, it can have been adopted by the kings only after their accession to the throne.

1. Artaxerxes I., surnamed *Macrocheir, Longimanus*, "Longhand," because his right hand was longer than his left (Plut. *Artax.* i.). He was the younger son of Xerxes, and was raised to the throne in 465 by the vizier Artabanus, the murderer of his father. After a few months he became aware of the crimes of the vizier, and slew him and his sons in a hand-to-hand fight in the palace. His reign was, on the whole, peaceful; the empire had reached a period of stagnation. Plutarch (*Artax.* i.) says that he was famous for his mild and magnanimous character, Nepos (*de Reg.* i.) that he was exceedingly beautiful and valiant. From the authentic report of his cup-bearer Nehemiah we see that he was a kind, good-natured, but rather weak monarch, and he was undoubtedly much under the baneful influence of his mother Amestris (for whose mischievous character cf. Herod. ix. 109 ff.) and his sister and wife Amytis. The peacefulness of his rule was interrupted by several insurrections. At the very beginning the satrap Artabanus raised a rebellion in Bactria, but was defeated in two battles. More dangerous was the rebellion of Egypt under Inarus (Inarōs), which was put down by Megabyzus only after a long struggle against the Egyptians and the Athenians (460-454). Out of it sprang the rebellion of Megabyzus, who was greatly exasperated because, though he had persuaded Inarus to surrender

by promising that his life would be spared, Artaxerxes, yielding to the entreaties of his wife Amytis, who wanted to take revenge on Inarus for the death of her brother Achaemenes, the satrap of Egypt, had surrendered him to her for execution.

In spite of his weakness, Artaxerxes I. was not unsuccessful in his polity. In 448 the war with Athens was terminated by the treaty concluded by Callias (but see CALLIAS and CIMON), by which the Athenians left Cyprus and Egypt to the Persians, while Persia gave up nothing of her rights, but promised not to make use of them against the Greek cities on the Asiatic coast, which had gained their liberty (Ed. Meyer, *Forschungen zur alt. Gesch.* ii. 71 ff.). In the Samian and the Peloponnesian wars, Artaxerxes remained neutral, in spite of the attempts made by both Sparta and Athens to gain his alliance.

During the reign of Artaxerxes I. the Jewish religion was definitely established and sanctioned by law in Jerusalem, on the basis of a firman granted by the king to the Babylonian priest Ezra in his seventh year, 458 B.C., and the appointment of his cup-bearer Nehemiah as governor of Judaea in his twentieth year, 445 B.C. The attempts which have been made to deny the authenticity of those parts of the books of Ezra and Nehemiah which contain an account of these two men, taken from their own memoirs, or to place them in the reign of Artaxerxes II., are not convincing (cf. Ed. Meyer, *Die Entstehung des Judentums*, 1896; see further JEWS, §§ 19, 21, 22; EZRA AND NEHEMIAH).

Artaxerxes I. died in December 425, or January 424 (Thuc. iv. 50). To his reign must belong the famous quadrilingual alabaster vases from Egypt (on which his name is written in Persian, Susian and Babylonian cuneiform characters and in hieroglyphics), for Artaxerxes II. and III. did not possess Egypt. A great many tablets, dated from his reign, have been found in Nippur (published by H. von Hilprecht and Clay, *The Babylonian*

Expedition of the University of Pennsylvania, series A, vol. ix.), and a few others at other places in Babylonia. Inscriptions of the king himself are not extant; his grandson mentions his buildings in Susa. For the suggested identification of Artaxerxes I. with the Biblical Ahasuerus, see AHASUERUS.

2. ARTAXERXES II., surnamed *Mnemon*, the eldest son of Darius II., whom he succeeded in the spring of 404. According to Ctesias (*Pers.* 57; Plut. *Artax.* i.) he was formerly called Arsaces or Arsikas, whereas Dinon (Plut. *Artax.* i.) calls him Oarses. This is corroborated by a Babylonian tablet with observations of the moon (Brit. Mus. Sp. ii. 749; *Zeitsch. f. Assyriologie*, vii. 223), which is dated from the 26th year of "Arshu, who is Artakshatsu," *i.e.* 379 B.C. (cp. Ed. Meyer, *Forschungen zur allen Geschichte*, ii. 466 ff.). When Artaxerxes II. mounted the throne, the power of Athens had been broken by Lysander, and the Greek towns in Asia were again subjects of the Persian empire. But his whole reign is a time of continuous decay; the original force of the Persians had been exhausted in luxury and intrigues, and the king, though personally brave and good-natured, was quite dependent upon his favourites and his harem, and especially upon his mother Parysatis. In the beginning of his reign falls the rebellion of his brother Cyrus, who was secretly favoured by Parysatis and by Sparta. Although Cyrus was defeated at Cunaxa, this rebellion was disastrous inasmuch as it opened to the Greeks the way into the interior of the empire, and demonstrated that no oriental force was able to withstand a band of well-trained Greek soldiers. Subsequently Greek mercenaries became indispensable not only to the king but also to the satraps, who thereby gained the means for attempting successful rebellions, into which they were provoked by the weakness of the king, and by the continuous intrigues between the Persian magnates. The reign is, therefore, a continuous succession of rebellions. Egypt soon revolted anew and could not be subdued again. When in 399 war broke out between Sparta and Persia, the Persian troops in Asia Minor were quite unable to resist the Spartan armies.

The active and energetic Persian general Pharnabazus succeeded in creating a fleet by the help of Evagoras, king of Salamis in Cyprus, and the Athenian commander Conon, and destroyed the Spartan fleet at Cnidus (August 394). This victory enabled the Greek allies of Persia (Thebes, Athens, Argos, Corinth) to carry on the Corinthian war against Sparta, and the Spartans had to give up the war in Asia Minor. But it soon became evident that the only gainers by the war were the Athenians, who in 389, under Thrasybulus, tried to found their old empire anew (see DELIAN LEAGUE). At the same time Evagoras attempted to conquer the whole of Cyprus, and was soon in open rebellion. The consequence was that, when in 388 the Spartan admiral Antalcidas (*q.v.*) came to Susa, the king was induced to conclude a peace with Sparta by which Asia fell to him and European Greece to Sparta. After the peace, Evagoras was attacked. He lost his conquests, but had to be recognized as independent king of Salamis (380 B.C.). Two expeditions against Egypt (385-383 and 374-372) ended in complete failure. At the same period there were continuous rebellions in Asia Minor; Pisidia, Paphlagonia, Bithynia and Lycia, threw off the Persian yoke and Hecatomnus, the satrap of Caria, obtained an almost independent position. Similar wars were going on against the mountain tribes of Armenia and Iran, especially against the Cadusians on the Caspian Sea. In this war Artaxerxes is said to have distinguished himself personally (380 B.C.), but got into such difficulties in the wild country that he was glad when Tiribazus succeeded in concluding a peace with the Cadusian chieftains.

By the peace of Antalcidas the Persian supremacy was proclaimed over Greece; and in the following wars all parties, Spartans, Athenians, Thebans, Argives continually applied to Persia for a decision in their favour. After the battle of Leuctra, when the power of Thebes was founded by Epaminondas, Pelopidas went to Susa (367) and restored the old alliance between Persia and Thebes. The Persian supremacy, however, was not based upon the power of the empire, but only on the discord of the Greeks. Shortly after the

edict by which the king had proclaimed his alliance with Thebes, and the conditions of the general peace which he was going to impose upon Greece, his weakness became evident, for since 366 all the satraps of Asia Minor (Datames, Ariobarzanes, Mausolus, Orontes, Artabazus) were in rebellion again, in close alliance with Athens, Sparta and Egypt. The king could do little against them; even Autophradates, satrap of Lydia, who had remained faithful, was forced for some time to unite himself with the rebels. But every one of the allies mistrusted all the others; and the sole object of every satrap was to improve his condition and his personal power, and to make a favourable peace with the king, for which his neighbours and former allies had to pay the costs. The rebellion was at last put down by a series of treacheries and perfidious negotiations. Some of the rebels retained their provinces; others were punished, as opportunity offered. Mithradates betrayed his own father Ariobarzanes, who was crucified, and murdered Datames, to whom he had introduced himself as a faithful ally. When the long reign of Artaxerxes II. came to its close in the autumn of 359 the authority of the empire had been restored almost everywhere.

Artaxerxes himself had done very little to obtain this result. In fact, in the last years of his reign he had sunk into a perfect dotage. All his time was spent in the pleasures of his harem, the intrigues of which were further complicated by his falling in love with and marrying his own daughter Atossa (according to the Persian religion a marriage between the nearest relations is no incest). At the same time, his sons were quarrelling about the succession; one of them, Ochus, induced the father by a series of intrigues to condemn to death three of his older brothers, who stood in his way. Shortly afterwards, Artaxerxes II. died.

In this reign an important innovation took place in the Persian religion. Berossus (in Clemens Alex. *Protrept.* i. 5. 65) tells us that the Persians knew of no images of the gods until Artaxerxes II. erected images of Anaitis

in Babylon, Susa, Ecbatana, Persepolis, Bactra, Damascus, Sardis. This statement is proved correct by the inscriptions; all the former kings name only Auramazda (Ahuramazda), but Artaxerxes II. in his building inscriptions from Susa and Ecbatana invokes Ahuramazda, Anahita and Mithra. These two gods belonged to the old popular religion of the Iranians, but had until then been neglected by the true Zoroastrians; now they were introduced into the official worship much in the way in which the cult of the saints came into the Christian religion. About the history of Artaxerxes II. we are comparatively well informed from Greek sources; for the earlier part of his reign from Ctesias and Xenophon (*Anabasis*), for the later times from Dinon of Ephesus, the historian of the Persians (from whom the account of Justin is derived), from Ephorus (whose account is quoted by Diodorus) and others. Upon these sources is based the biography of the king by Plutarch.

3. Artaxerxes III. is the title adopted by Ochus, the son of Artaxerxes II., when he succeeded his father in 359. The chronographers generally retain the name Ochus, and in the Babylonian inscriptions he is called "Umasu, who is called Artakshatsu." The same form of the name (probably pronounced Uvasu) occurs in the Syrian version of the canon of Ptolemy by Elias of Nisibis (Amōs).

Artaxerxes III. was a cruel but an energetic ruler. To secure his throne he put to death almost all his relatives, but he suppressed the rebellions also. In 356 he ordered all the satraps to dismiss their mercenaries. Most of them obeyed; Artabazus of Phrygia, who tried to resist and was supported by his brothers-in-law, Mentor and Memnon of Rhodes, was defeated and fled to Philip of Macedon. Athens, whose general Chares had supported Artabazus, was by the threatening messages of the king forced to conclude peace, and to acknowledge the independence of its rebellious allies (355 b.c.). Then the king attempted to subjugate Egypt, but two expeditions were unsuccessful, and, in consequence, Sidon and the other Phoenician towns,

and the princes of Cyprus, rebelled against Persia and defeated the Persian generals. After great preparations the king came in person, but again the attack on Egypt was repelled by the Greek generals of Nectanebus (346). One or two years later Artaxerxes, at the head of a great army, began the siege of Sidon. The Sidonian king Tennes considered resistance hopeless, and betrayed the town to the Persian king, assisted by Mentor, who had been sent with Greek troops from Egypt to defend the town. Artaxerxes repressed the rebellion with great cruelty and destroyed the town. The traitor Tennes was put to death, but Mentor rose high in the favour of the king, and entered into a close alliance with the eunuch Bagoas, the king's favourite and vizier. They succeeded in subjecting the other rebels, and, after a hard fight at Pelusium, and many intrigues, conquered Egypt (343); Nectanebus fled to Ethiopia. Artaxerxes used his victory with great cruelty; he plundered the Egyptian temples and is said to have killed the Apis. After his return to Susa, Bagoas ruled the court and the upper satrapies, while Mentor restored the authority of the empire everywhere in the west. He deposed or killed many Greek dynasts, among them the famous Hermias of Atarneus, the protector of Aristotle, who had friendly relations with Philip (342 B.C.). When Philip attacked Perinthus and Byzantium (340), Artaxerxes sent them support, by which they were enabled to withstand the Macedonians; Philip's antagonists in Greece, Demosthenes and his party, hoped to get subsidies from the king, but were disappointed.

In 338 Artaxerxes III., with his older sons, was killed by Bagoas, who raised his youngest son Arses to the throne. Artaxerxes III. is said never to have entered the country of Persia proper, because, being a great miser, he would not pay the present of a gold piece for every Persian woman, which it was usual to give on such occasions (Plut. *Alex.* 69). But we have a building inscription from Persepolis, which contains his name and genealogy, and invocations of Ahuramazda and Mithra.

For the relations of Artaxerxes I.—III. with the Jews see JEWS, §§ 19-21. For bibliographical references see PERSIA: *Ancient History*.

The name Artaxerxes was adopted by Bessus when he proclaimed himself king after the assassination of Darius III. It was borne by several dynasts of Persis, when it formed an independent kingdom in the time of the Parthian empire (on their coins they call themselves Artakhshathr; one of them is mentioned by Lucian, *Macrobii*, 15), and by three kings of the Sassanid dynasty, who are better known under the modern form Ardashir (*q.v.*).

(ED. M.)

ARTEDI, PETER (1705-1735), Swedish naturalist, was born in the province of Angermania, in Sweden, on the 22nd of February 1705. Intending to become a clergyman, he went, in 1724, to study theology at Upsala, but he turned his attention to medicine and natural history, especially ichthyology, upon the study of which he exercised great influence (see ICHTHYOLOGY). In 1728 his countryman Linnaeus arrived in Upsala, and a lasting friendship was formed between the two. In 1732 both left Upsala, Artedi for England, and Linnaeus for Lapland; but before parting they reciprocally bequeathed to each other their manuscripts and books in the event of death. He was accidentally drowned on the 27th of September 1735 at Amsterdam, where he was engaged in cataloguing the collections of Albert Seba, a wealthy Dutchman, who had formed what was perhaps the richest museum of his time. According to agreement, his manuscripts came into the hands of Linnaeus, and his *Bibliotheca*

Ichthyologica and *Philosophia Ichthyologica*, together with a life of the author, were published at Leiden in the year 1738.

ARTEGA, a tribe of African "Arabs," said to be descendants of a sheik of that name who came from Hadramut in pre-Islamic days, settling near Tokar. The name is said to be "patrician," and the Artega may be regarded as the most ancient stock in the Suakin district. They are now an inferior mixed race. They were all followers of the mahdi and khalifa in the Sudan wars (1883-1898).

See *Anglo-Egyptian Sudan*, edited by Count Gleichen (London, 1905).

ARTEL (Russ. for "gang"), the name for the co-operative associations in Russia. Originally, the artels were true examples of productive co-operation, bodies of working-men associating together for the purpose of jointly undertaking some piece of work, and dividing the profits. This original form of artel still survives among the fishermen of Archangel. Artels have come, however, to be little more than trade gilds, with mutual responsibility. (For details see RUSSIA.)

ARTEMIDORUS. (1) A geographer "of Ephesus" who flourished about 100 B.C. After studying at Alexandria, he travelled extensively and published the results of his investigations in a large work on general geography (Τὰ γεωγραφούμενα) in eleven books, much used by Strabo and others. The original work is lost, but we possess many small fragments and larger fragments of an abridgment made by Marcianus of Heracleia (5th century), which contains the periplus of the Euxine and accounts of Bithynia and Paphlagonia. (See Müller, *Geographi Graeci Minores*; Bunbury, *History of Ancient Geography*; Stiehle, "Der Geograph Artemidoros von Ephesos," in *Philologus*, xi., 1856). (2) A soothsayer and interpreter of dreams, who flourished in the 2nd century A.D., during the reigns of Hadrian and the Antonines. He called himself Daldianus from his mother's birthplace, Daldis in Lydia, in order to make its name known to the world. His Ὀνειροκριτικά, or interpretation of dreams, was said to have been written by command of Apollo Daldianus, whose initiated votary he was. It is in four books, with an appendix containing a collection of prophetic dreams which had been realized. The first three books, addressed to Cassius Maximus, a Phoenician rhetorician (perhaps identical with Maximus of Tyre), treat of dreams and divination generally; the fourth—with a reply to his critics—and the appendix are dedicated to his son, also named Artemidorus and an interpreter of dreams. Artemidorus boasts of the trouble expended on his work; he had read all the authorities on dreams, travelled extensively, and conversed with all who had studied the subject. The work is valuable as affording an insight into ancient superstitions. According to Suidas, Artemidorus also wrote on augurs and cheiromancy, but all trace of these works is lost. (Editions: Reiff, 1805, Hercher, 1864;

translation and notes, Krauss, 1881; English translation by Wood, 1644, and later editions.)

ARTEMIS, one of the principal goddesses in Greek mythology, the counterpart of the Roman Diana. The suggested etymologies of the name (see O. Gruppe, *Griechische Mythologie*, ii. p. 1267, note 2), as in the case of most of the Olympian deities, are unsatisfactory, and throw no light upon her significance and characteristics. The Homeric and later conception of Artemis, though by no means the original one, may be noticed first. She is the daughter of Zeus and Leto, twin-sister and counterpart of Apollo. She is said to have been born a day before him (on the 6th of the month) and tradition assigns them different birthplaces—Delos to Apollo, Ortygia to Artemis. But Ortygia ("home of quails") applies still to Delos, and may well have been a synonym for that island. In its original sense it does not apply either to the island of Ortygia at Syracuse, or to Ortygia near Ephesus, which also claimed the honour of having been the birthplace of the goddess. Artemis is the goddess of chastity, an aspect of her character which gradually assumed more and more importance—the protectress of young men and maidens, who defies and contemns the power of Aphrodite. Her resemblance to her brother is shown in many ways. Like him, armed with bow and arrows, she deals death to mortals, sometimes gently and suddenly, especially to women, but also as a punishment for offences against herself or morality. With him she takes part in the combat with Python and with Tityus, in the slaughter of the children of Niobe, while alone she executes vengeance on Orion. Although Apollo has nothing to do

with the earlier cult of Artemis, nor Artemis with that of Delphi, their association was a comparatively early one, and probably originated in Delos. Here the connexion of Artemis with the Hyperborean legend (see APOLLO) is shown in the names of the maidens (Opis, Hecaerge) who were supposed to have brought offerings from the north to Delos, where they were buried. Both Opis (or Oupis) and Hecaerge are names of Artemis, the latter being the feminine of Hecaergos, an epithet of Apollo. Like her brother, she is not only a goddess who deals death, but she is also a healing and a purifying divinity, οὐλία ("the healer," cf. Apollo Oulios), λύη, λυαία ("purifier,") and σώτειρα, "she who saves from all evils" (cf. Apollo ἀποτρόπαιος). Her connexion with the prophetic art is doubtful, although mention is made of an Artemis Sibylla. To her association with Apollo are certainly to be referred the names Delphinia and Pythia, and the titles referring to state and family life—προστατηρία, πατριῶτις, βουλαία. It probably accounts for her appearance as a goddess of seafarers, the bestower of fair weather and prosperous voyages. At Phigalia in Arcadia, Eurynome, represented as half woman and half fish, was probably another form of Artemis. To the same association may be traced her slight connexion with music, song and dance.

It is in the Arcadian and Athenian rites and legends, however, which are certainly earlier than Homer, that the original conception of the goddess is to be found. These tend to show that Artemis was first and foremost a nature goddess, whose cult shows numerous traces of totemism. As a goddess of fertilizing moisture, lakes, rivers, springs, and marshy lowlands are brought into close connexion with her. Thus she is λιμναία, δέσποινα λίμνης ("lady of the lake"), ἑλεία ("of marshes"), ποταμία ("of rivers," especially of the Cladaus and Alpheus, whence her name Ἀλφειαία). Her influence is very active in promoting the increase of the fruits of the field, hence she is specially a goddess of agriculture. She drives away the mice (cf. Apollo Smintheus) and slays the Aloidae, the corn spirits; she is the

friend of the reapers, and requires her share of the first fruits. Her character as a harvest goddess is clearly shown in the legend of the Calydonian boar, sent by her to ravage the fields out of resentment at not having received a harvest offering from Oeneus (see MELEAGER). As ἐπιμύλιος and ἐπικλιβάνιος ("presiding over the mill and the oven") she extends her protection over the further development of the grain for the use of man.

Artemis was naturally also a goddess of trees and vegetation. Near Orchomenus her wooden image stood in a large cedar-tree—an indication that her worship was originally that of the tree itself (κεδρεᾶτις, "the cedar goddess"); at Caryae there was an image of Artemis καρυᾶτις ("the nut-tree goddess"). Two curious epithets in this connexion deserve notice: λυγοδέσμα ("bound with withies"), derived from the legend that the image of Artemis Orthia was found in a thicket of withies, which twined round it and kept it upright (λύγος is the *agnus castus*, and points to Artemis in her relation to women); and ἀπαγχομένη ("the suspended"), probably a reference to the custom of hanging the mask or image of a vegetation-divinity on a tree to obtain fertility (Farnell, *Cults of the Greek States*, ii. p. 429; cf. the "swing" festival (αἰώρα) of the Greeks, and the *oscilla* of the Romans).

The functions of the goddess extended from the vegetable to the animal world, to the inhabitants of the woods and mountains. This is clearly expressed in the cult of Artemis Laphria (possibly connected with λάφυρα, "spoils"), at whose festivals all kinds of animals, both wild and tame, as well as fruits, were thrown together on a huge wood fire. Her general name in this connexion was ἀγροτέρα ("roaming the wilds," not necessarily "goddess of the chase," an aspect less familiar in the older religion), to whom five hundred goats were offered every year by the Athenians as a thanksgiving in commemoration of the victory at Marathon. Numerous animals were sacred to her, and at Syracuse all kinds of wild beasts,

including a lioness, were carried in procession in her honour. It has been observed that she is rather the patroness of the wild beasts of the field than of the more agricultural or domestic animals (Farnell, *Cults*, ii. p. 431), although the epithet ἡμερασία ("the tamer," according to others, the "gentle" goddess of healing) seems to refer to her connexion with the latter. The bear was especially associated with her in Arcadia, and in her worship as Artemis Brauronia at Brauron in Attica. According to the legend, Callisto, an Arcadian nymph, became by Zeus the mother of Arcas, the eponymous hero of the Arcadians. Zeus, to conceal the amour, changed Callisto into a she-bear; Hera, however, discovered it, and persuaded Artemis to slay Callisto, who was placed amongst the stars as ἄρκτος ("the bear"). There is no doubt that Callisto is identical with Artemis; her name is an obvious variation of καλλίστη, a frequent epithet of the goddess, to whom a temple was erected on the hill where Callisto was supposed to be buried. It is suggested by M. Kraus in *Classical Review*, February 1908, that Aphaea, the cult-name of Artemis at Aegina, is of Semitic origin and means "beautiful." Closely connected with this legend is the worship of Artemis Brauronia. The accounts of its institution, which differ in detail, agree that it was intended to appease the wrath of the goddess at the killing of a bear. A number of young girls, between five and ten years of age, wearing a bear-skin (afterwards a saffron-coloured robe) danced a bear-dance, called ἀρκτεία, the girls themselves being called ἄρκτοι. In one account, a maiden was ordered to be sacrificed to the bear Artemis, but a certain man who had a goat called it his daughter and offered it up in secret, just as at Munychium a fawn dressed up as a girl was sacrificed to the goddess. In place of the goat or fawn a bear might have been expected, but the choice may have been influenced by the animal totem of the tribe into whose hands the ritual fell. The whole is a reminiscence of earlier times, when the goddess herself was a bear, to whom human sacrifice was offered. Callisto was originally a bear-goddess worshipped in Arcadia, identified

with Artemis, when nothing remained of the original animal-worship but name and ritual. The worship of Callisto being merged in that of the greater divinity, she became the handmaid and companion of Artemis. A stone figure of a bear found on the Acropolis seems to point to the worship of Artemis Brauronia. Her death at the hands of the latter was explained by the wrath of the goddess—in her later aspect as goddess of chastity—at Callisto's amour with Zeus (see A. Lang, *Myth, Ritual and Religion*, ii.; Farnell, *Cults*, ii. p. 437). The custom of flogging youths at the altar of Artemis Orthia[1] at Limnaeum in Laconia, and the legend of Iphigeneia (*q.v.*), herself another form of Artemis, connected with Artemis Taurica of the Tauric Chersonese, are usually supposed to point to early human sacrifice (but see Farnell). Various explanations have been given of the epithet ὀρθία: (1) that it refers to the primitive type of the "erect" wooden idol; (2) that it means "she who safely rears children after birth," or "heals the sick" (cf. ὄρθιος applied to Asclepius); (3) that it has a phallic significance (Schreiber in Roscher's *Lexikon*). Scholars differ as to whether Artemis Taurica is identical with Artemis Tauropolos, worshipped chiefly at Samos with a milder ritual, but it is more probable that ταυροπόλος simply means "protectress of bulls."

The protecting influence of Artemis was extended, like that of Apollo, to the highest animal, man. She was especially concerned in the bringing up of the young. Boys were brought by their nurses to the temple of Artemis κορυθαλία (= κουροτρόφος) and there consecrated to her; at the Apaturia, on the day called κουρεῶτις, boys cut off and dedicated their hair to her. Girls as well as boys were under her protection. Her function as a goddess of marriage is less certain, and the cult-titles adduced in support of it are hardly convincing; such are ἡγεμόνη, interpreted as "she who leads home the bride," σελασφόρος, "bearer of light," that is, of torches at the marriage procession. On the other hand, her connexion with childbirth is clearly shown: in many places she is even called Eilithyia, who in the

earlier poets was regarded as distinct from her. In one version of the story of her birth she is said to have been born a day before Apollo, in order to assist Leto at his birth; women in childbirth invoked her aid, and after delivery offered up their clothes or a lock of hair. As already noticed, in Homer Artemis appears as a goddess of death; closely akin to this is the conception of her as a goddess of war. As such she is νικηφόρος ("bringer of victory"); the title κολαινίς is possibly connected with κολεὸς ("sword-sheath"); and λαφρία (see above) may refer to the spoils of war as well as the chase.

The idea of Artemis as a virgin goddess, the "queen and huntress, chaste and fair," which obtained great prominence in early times, and seems inconsistent with her association with childbirth, is generally explained as due to her connexion with Apollo, but it is suggested by Farnell that παρθένος originally meant "unmarried," and that "Ἄρτεμις παρθένος may have been originally the goddess of a people who had not yet the advanced Hellenic institutions of settled marriage ... and when society developed the later family system the goddess remained celibate, though not opposed to childbirth."

Another view of the original character of Artemis, which has found much support in modern times, is that she was a moon-goddess. But there is no trace of Artemis as such in the epic period, and the Homeric hymn knows nothing of her identification with Selene. The attribute of the torch will apply equally well to the goddess of the chase, and epithets such as φωσφόρος, σελασφόρος, αἰθοπία, although applicable, are by no means convincing. The idea dates from the 5th century, and was due to her connexion with Hecate and Apollo. When the latter came to be identified by philosophical speculation with the sun-god Helios, it was natural that his sister and counterpart should be identified with the moon-goddess Selene.

But she is nowhere recognized in cult as such (see Gruppe, *Griechische Mythologie*, ii. p. 1297, note 2).

It has been mentioned that Callisto, Iphigeneia, Eilithyia, are only Artemis under different names; to these may be added Adrasteia, Atalanta, Helen, Leto and others (see Wernicke in Pauly-Wissowa's *Realencyclopädie*).

Again, various non-Hellenic divinities were identified with Artemis, and their cult gradually amalgamated with hers. The most important of these was Artemis of Ephesus, whose seat was in the marshy valley of the Caystrus. Like the Greek Artemis, she was essentially a nature goddess, the great foster-mother of the vegetable and animal kingdom. A number of officials were engaged in the performance of her temple service. Her eunuch priests, μεγάβυζοι (a name which points to a Persian origin), were under the control of a high priest called Essen (according to others, there was a body of priests called Essenes). There were also three classes of priestesses, Mellierae, Hierae, Parierae; there is no evidence that they were called Melissae ("bees"), although the bee is a frequent symbol on the coins of the city. Her chief festival, Ephesia or Artemisia, was held in the spring, at which games and various contests took place after the Greek fashion, although the ritual continued to be of a modified oriental, orgiastic type. This goddess is closely connected with the Amazons (*q.v.*), who are said to have built her temple and set up her image in the trunk of a tree. The Greeks of Ephesus identified her with their own Artemis, and claimed that her birthplace Ortygia was near Ephesus, not in Delos. She has much in common with the oriental prototype of Aphrodite, and the Cappadocian goddess Ma, another form of Cybele. The usual figure of the Ephesian Artemis, which was said in the first instance to have fallen from heaven, is in the form of a female with many breasts, the symbol of productivity or a token of her function as the all-nourishing mother. From the waist to the

feet her image resembles a pillar, narrowing downwards and sculptured all round with rows of animals (lions, rams and bulls).

Mention may also be made of the following non-Hellenic representatives of Artemis. Leucophryne (or Leucophrys), whose worship was brought by emigrants from Magnesia in Thessaly to Magnesia on the Maeander, was a nature goddess, and her representation on coins exactly resembles that of the Ephesian Artemis. Her cult, however, from the little that is known of it appears to have been more Hellenic. There was an altar and temple of Artemis Pergaea at Perga in Pamphylia, where a yearly festival was held in her honour. As in the case of Cybele, mendicant priests were attached to her service. Similar figures were Artemis Coloēnē, worshipped at Lake Coloē near Sardis; Artemis Cordax, celebrated in wanton dances on Mount Sipylus; the Persian Artemis, identical with Anaitis Bendis, was a Thracian goddess of war and the chase, whose cult was introduced into Attica in the middle of the 5th century B.C. by Thracian metics. At her festival called Bendidea, held at the Peiraeus, there was a procession of Thracians who were settled in the district, and a torch-race on horseback. (For Britomartis see separate article.)

Among the chief attributes of Artemis are: the hind, specially regarded as her sacred animal; the bear, the boar and the goat; the zebu (Artemis Leucophrys); the lion, one of her oldest animal symbols; bow and arrows, as goddess of the chase and death; a mural crown, as the protectress of cities; the torch, originally an attribute of the goddess of the chase or marriage, but, like the crescent (originally an attribute of the Asiatic nature goddesses), transferred to Artemis, when she came to be regarded as a moon-goddess. The Greek Artemis was usually represented as a huntress with bow and quiver, or torch in her hand, in face very like Apollo, her drapery flowing to her feet, or, more frequently, girt high for speed. She is accompanied often by a deer or a dog. Perhaps the finest existing statue of

her is the Diana of Versailles from Hadrian's Villa (now in the Louvre), in which she wears a short tunic drawn in at the waist and sandals on her feet; her hair is bound up into a knot at the back of her head, with a band over the forehead. With her left hand she holds a stag, while drawing an arrow from the quiver on her shoulder with the right. Another famous statue is one from Gabii, in which she is finishing her toilet and fastening the chlamys over her tunic. In older times her figure is fuller and stronger, and the clothing more complete; certain statues discovered at Delos, imitated from wooden models (xoana), are supposed to represent Artemis; they are described as stiff and rigid, the limbs as it were glued to the body without life or movement, garments closely fitting, the folds of which fall in symmetrical parallel lines. As a goddess of the moon she wears a long robe, carries a torch, and her head is surmounted by a crescent. On the coins of Arcadia, Aetolia, Crete and Sicily, are to be seen varied and beautiful representations of her head as conceived by the Greek artists in the best times.

AUTHORITIES.—Articles in Pauly-Wissowa's *Realencyclopädie*; Roscher's *Lexikon der Mythologie*, and Daremberg and Saglio's *Dictionnaire des antiquités* (s.v. Diana, with well-arranged bibliography); L. Preller, *Griechische Mythologie* (4th ed. by C. Robert); L.R. Farnell, *The Cults of the Greek States*, ii. (1896); O. Gruppe, *Griechische Mythologie und Religions-Geschichte*, ii. (1906); A. Claus, *De Dianae antiquissima apud Graecos natura* (Breslau, 1880). In the article GREEK ART, fig. 11 (a gold ornament from Camirus) represents the Oriental goddess identified by the Greeks with Artemis.

For the Roman goddess identified with Artemis see DIANA.

(J. H. F.)

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1 The site of the temple of Artemis Orthia was excavated by the British School of Archaeology at Athens (see *Annual*, 1906). The flogging (διαμαστίγωσις) is explained

by R.C. Bosanquet as a late institution of decadent Sparta, an exaggeration of an old ritual practice of whipping away boys who tried to steal cheeses from the altar (see *The Year's Work in Classical Studies*, ed. W.H.D. Rouse, 1907).

ARTEMISIA, daughter of Lygdamis, was queen of Halicarnassus and Cos about 480 B.C. Being a dependent of Persia, she took part in person in the expedition of Xerxes against the Greeks, and fitted out five ships, with which she distinguished herself in the sea-fight near Salamis (480). When closely pursued by the Athenians she escaped by the stratagem of attacking one of the Persian vessels, whereupon the Athenians concluded that she was an ally, and gave up the pursuit (Herod. vii. 99, viii. 68). After the battle Xerxes declared that the men had fought like women, and the women like men. By her advice he did not risk another battle, but at once retired from Greece. She is said to have loved a young man named Dardanus, of Abydos, and, enraged at his neglect of her, to have put out his eyes while he was asleep. The gods, as a punishment for this, ordered her, by an oracle, to take the famous but rather mythical *lover's leap* from the Leucadian promontory (Photius, *Cod.* 153*a*).

ARTEMISIA, the sister and wife of Mausolus (or Maussollus), king of Caria, was sole ruler from about 353 to 350 B.C. She has immortalized

herself by the honours paid to the memory of her husband. She built for him, in Halicarnassus, a very magnificent tomb, called the Mausoleum, which was one of the seven wonders of the world, and from which the name mausoleum was afterwards given to all tombs remarkable for their grandeur. She appointed panegyrics to be composed in his honour, and offered valuable prizes for the best oratorical and tragic compositions. She also erected a monument, or trophy, in Rhodes, to commemorate her conquest of that island. When the Rhodians regained their freedom they built round this trophy so as to render it inaccessible, whence it was known as the *Abaton*. There are statues of Mausolus and Artemisia in the British Museum.

Vitruvius ii. 8; Diodorus Siculus xvi. 36; Cicero, *Tusc.* iii. 31; Val. Max. iv. 6.

ARTEMON (fl. *c.* A.D. 230), a prominent Christian teacher at Rome, who held Adoptianist (see ADOPTIANISM), or humanitarian views, of the same type as his elder contemporaries the Theodotians, though perhaps asserting more definitely than they the superiority of Christ to the prophets in respect of His supernatural birth and sinlessness. He was excommunicated by Zephyrinus, despite his remarkable claim that all that bishop's predecessors in the see of Rome had held the humanitarian position. (See also MONARCHIANISM.)

ARTENA, a village of Italy, in the province of Rome, situated at the N.N.W. extremity of the Volscian Mountains; it is 36 m. S.E. by rail, and 24 m. direct from Rome. Pop. (1901) 5016. On the mountain above it (2073 ft.) are the fine remains of the fortifications of a city built in a very primitive style, in cyclopean blocks of local limestone; within the walls are traces of buildings, and a massive terrace which supported some edifice of importance. The name of this city is quite uncertain; Ecetra is a possible suggestion. The modern village, which was called Monte Fortino until 1870, owes its present name to an unwarrantable identification of the site with the ancient Volscian Artena, destroyed in 404 B.C. Another Artena, which belonged to the district of Caere, and lay between it and Veii, was destroyed in the period of the kings, and its site is quite unknown.

See T. Ashby and G.J. Pfeiffer in *Supplementary Papers of the American School in Rome*, i. 87 seq.

ARTERIES (Gr. ἀρτηρία, probably from αἴρειν, to raise, but popularly connected by the ancients with ἀήρ, air), in anatomy, the elastic tubes which carry the blood away from the heart to the tissues. As, after death, they are always found empty, the older anatomists believed that they contained air, and to this belief they owe the name, which was originally given to the windpipe (*trachea*). Two great trunks, the aorta and pulmonary artery, leave the heart and divide again and again, until they become minute vessels to which the name of arterioles is given. The larger trunks are fairly constant in position and receive definite names, but as the smaller branches are reached there is an increasing inconstancy in their position, and

anatomists are still undecided as to the normal, *i.e.* most frequent, arrangement of many of the smaller arteries. From a common-sense point of view it is probably of greater importance to realize how variable the distribution of small arteries is than to remember the names of twigs which are of neither surgical nor morphological importance. Arteries adapt themselves more quickly than most other structures to any mechanical obstruction, and many of the differences between the arterial systems of Man and other animals are due to the assumption of the erect position. Many arteries are tortuous, especially when they supply movable parts such as the face or scalp, but when one or two sharp bends are found they are generally due to the artery going out of its way to give off a constant and important branch. Small arteries unite or anastomose with others near them very freely, so that when even a large artery is obliterated a collateral circulation is carried on by the rapid increase in size of the communications between the branches coming off above and below the point of obstruction. Some branches, however, such as those going to the basal ganglia of the brain and to the spleen, are known as "end arteries," and these do not anastomose with their neighbours at all; thus, if one is blocked, arterial blood is cut off from its area of supply. As a rule, there is little arterial anastomosis across the middle line of the body near the surface, though the scalp, lips and thyroid body are exceptions.

The distribution of the pulmonary artery is considered in connexion with the anatomy of the lungs (see RESPIRATORY SYSTEM). That of the aorta will now be briefly described.

Aorta.

The *Aorta* lies in the cavities of the thorax and abdomen, and arises from the base of the left ventricle of the heart. It ascends forward, upward, and to the right as far as the level of the second right costal cartilage, then runs backward, and to the left to reach the left side of the body of the 4th thoracic

vertebra, and then descends almost vertically. It thus forms the *arch of the aorta*, which arches over the root of the left lung, and which has attached to its concave surface a fibrous cord, known as the obliterated *ductus arteriosus*, which connects it with the left branch of the pulmonary artery. The aorta continues its course downward in close relation to the bodies of the thoracic vertebrae, then passes through an opening in the diaphragm (*q.v.*), enters the abdomen, and descends in front of the bodies of the lumbar vertebrae as low as the 4th, where it usually divides into two terminal branches, the common iliac arteries. Above and behind the angle of bifurcation, however, a long slender artery, called the *middle sacral*, is prolonged downward in front of the sacrum to the end of the coccyx.

It will be convenient to describe the distribution of the arteries under the following headings:—(1) Branches for the head, neck and upper limbs; (2) branches for the viscera of the thorax and abdomen; (3) branches for the walls of the thorax and abdomen; (4) branches for the pelvis and lower limbs.

The branches for the head, neck and upper limbs arise as three large arteries from the transverse part of the aorta; they are named *innominate, left common carotid* and *left subclavian*. The innominate artery is the largest and passes upward and to the right, to the root of the neck, where it divides into the right common carotid and the right subclavian. The carotid arteries supply the two sides of the head and neck; the subclavian arteries the two upper extremities.

The *common carotid* artery runs up the neck by the side of the windpipe, and on a level with the upper border of the thyroid cartilage divides into the internal and external carotid arteries.

Carotid system.

The *internal carotid* artery ascends through the carotid canal in the temporal bone into the cranial cavity. It gives off an *ophthalmic* branch to the eyeball and other contents of the orbit, and then divides into the *anterior* and *middle cerebral* arteries. The middle cerebral artery extends outward into the Sylvian fissure of the brain, and supplies the island of Reil, the orbital part, and the outer face of the frontal lobe, the parietal lobe, and the temporo-sphenoidal lobe; it also gives a choroid branch to the choroid plexus of the velum interpositum. The anterior cerebral artery supplies the inner face of the hemisphere from the anterior end of the frontal lobe as far back as the internal parieto-occipital fissure. At the base of the brain not only do the two internal carotids anastomose with each other through the *anterior communicating* artery, which passes between their anterior cerebral branches, but the internal carotid on each side anastomoses with the posterior cerebral branch of the basilar, by a *posterior communicating* artery. In this manner a vascular circle, the *circle of Willis*, is formed, which permits of freedom of the arterial circulation by the anastomoses between arteries not only on the same side, but on opposite sides of the mesial plane. The vertebral and internal carotid arteries, which are the arteries of supply for the brain, are distinguished by lying at some depth from the surface in their course to the organ, by having curves or twists in their course, and by the absence of large collateral branches.

The *external carotid* artery ascends through the upper part of the side of the neck, and behind the lower jaw into the parotid gland, where it divides into the internal maxillary and superficial temporal branches. This artery gives off the following branches:—(*a*) *Superior thyroid* to the larynx and thyroid body; (*b*) *Lingual* to the tongue and sublingual gland; (*c*) *Facial* to the face, palate, tonsil and sub-maxillary gland; (*d*) *Occipital* to the sterno-mastoid muscle and back of the scalp; (*e*) *Posterior auricular* to the back of the ear and the adjacent part of the

scalp; (*f*) *Superficial temporal* to the scalp in front of the ear, and by its *transverse facial* branch to the back part of the face; (*g*) *Internal maxillary*, giving *muscular* branches to the muscles of mastication, *meningeal* branches to the dura mater, *dental* branches to the teeth, and other branches to the nose, palate and tympanum; (*h*) *Ascending pharyngeal*, which gives branches to the pharynx, palate, tonsils and dura mater.

Subclavian system.

The *subclavian* artery is the commencement of the great arterial trunk for the upper limb. It passes across the root of the neck and behind the clavicle, where it enters the armpit, and becomes the *axillary* artery; by that name it extends as far as the posterior fold of the axilla, where it enters the upper arm, takes the name of brachial, and courses as far as the bend of the elbow; here it bifurcates into the *radial* and *ulnar* arteries. From the subclavian part of the trunk the following branches arise:—(*a*) *Vertebral*, which enters the foramen at the root of the transverse process of the 6th cervical vertebra, ascends through the corresponding foramina in the vertebrae above, lies in a groove on the arch of the atlas, and enters the skull through the foramen magnum, where it joins its fellow to form the *basilar* artery; it gives off *muscular* branches to the deep muscles of the neck, *spinal* branches to the spinal cord, *meningeal* branches to the dura mater, and an *inferior cerebellar* branch to the under surface of the cerebellum. The *basilar* artery, formed by the junction of the two vertebrals, extends from the lower to the upper border of the pons Varolii; it gives off *transverse* branches to the pons, *auditory* branches to the internal ear, *inferior cerebellar* branches to the under surface of the cerebellum, whilst it breaks up into four terminal branches, viz. two *superior cerebellar* to the upper surface of the cerebellum, and two *posterior cerebral* which supply the tentorial and mesial aspects of the temporo-sphenoidal lobes, the

occipital lobes, and the posterior convolutions of the parietal lobes. (*b*) *Thyroid axis*, which immediately divides into the *inferior thyroid*, the *supra-scapular*, and the *transverse cervical* branches; the *inferior thyroid* supplies the thyroid body, and gives off an *ascending cervical* branch to the muscles of the neck; the *supra-scapular* supplies the muscles on the dorsum scapulae; the *transverse cervical* supplies the trapezius and the muscles attached to the vertebral border of the scapula. (*c*) *Internal mammary* supplies the anterior surface of the walls of the chest and abdomen, and the upper surface of the diaphragm. (*d*) *Superior intercostal* supplies the first intercostal space, and by its deep *cervical* branch the deep muscles of the back of the neck.

The *axillary* artery supplies *thoracic* branches to the wall of the chest, the pectoral muscles, and the fat and glands of the axilla; an *acromio-thoracic* to the parts about the acromion; *anterior* and *posterior circumflex* branches to the shoulder joint and deltoid muscle; a *subscapular* branch to the muscles of the posterior fold of the axilla.

The *brachial* artery supplies *muscular* branches to the muscles of the upper arm; a *nutrient* branch to the humerus; *superior* and *inferior profunda* branches and an *anastomotic* to the muscles of the upper arm and the region of the elbow joint.

The *ulnar* artery extends down the ulnar side of the front of the fore-arm to the palm of the hand, where it curves outward toward the thumb, and anastomoses with the superficial volar or other branch of the radial artery to form the *superficial palmar arch*. In the fore-arm the ulnar gives off the *interosseous* arteries, which supply the muscles of the fore-arm and give *nutrient* branches to the bones; two *recurrent* branches to the region of the elbow; *carpal* branches to the wrist joint: in the hand it gives a *deep* branch to the deep muscles of the hand, and

from the superficial arch arise *digital* branches to the sides of the little, ring, and middle fingers, and the ulnar border of the index finger.

The *radial* artery extends down the radial side of the front of the fore-arm, turns round the outer side of the wrist to the back of the hand, passes between the 1st and 2nd metacarpal bones to the palm, where it joins the deep branch of the ulnar, and forms the *deep palmar arch*. In the fore-arm it gives off a *recurrent* branch to the elbow joint; *carpal* branches to the wrist joint; and *muscular* branches, one of which, named superficial volar, supplies the muscle of the thumb and joins the ulnar artery: in the hand it gives off a branch to the thumb, and one to the radial side of the index, *interosseous* branches to the interosseous muscles, *perforating* branches to the back of the hand, and *recurrent* branches to the wrist.

The branches of the aorta which supply the viscera of the thorax are the coronary, the oesophageal, the bronchial and the pericardiac. The *coronary* arteries, two in number, are the first branches of the aorta, and arise opposite the anterior and left posterior segments of the semilunar valve, from the wall of the aorta, where it dilates into the sinuses of Valsalva. They supply the tissue of the heart.

Visceral branches.

The *oesophageal*, *bronchial* and *pericardiac* branches are sufficiently described by their names.

The branches of the aorta which supply the viscera of the abdomen arise either singly or in pairs. The single arteries are the coeliac axis, the superior mesenteric, and the inferior mesenteric, which arise from the front of the aorta; the pairs are the capsular, the two renal, and the two spermatic or ovarian, which arise from its sides. The single arteries supply viscera which are either completely or almost completely

invested by the peritoneum, and the veins corresponding to them are the roots of the vena portae. The pairs of arteries supply viscera developed behind the peritoneum, and the veins corresponding to them are rootlets of the inferior vena cava.

The *coeliac axis* is a thick, short artery, which almost immediately divides into the gastric, hepatic and splenic branches. The *gastric* gives off oesophageal branches and then runs along the lesser curvature of the stomach. The *hepatic* artery ends in the substance of the liver; but gives off a *cystic* branch to the gall bladder, a *pyloric* branch to the stomach, a *gastro-duodenal* branch, which divides into a *superior pancreatico-duodenal* for the pancreas and duodenum, and a *right gastro-epiploic* for the stomach and omentum. The *splenic* artery ends in the substance of the spleen; but gives off *pancreatic* branches to the pancreas, *vasa brevia* to the left end of the stomach, and a *left gastro-epiploic* to the stomach and omentum.

The *superior mesenteric* artery gives off an *inferior pancreatico-duodenal* branch to the pancreas and duodenum; about twelve *intestinal* branches to the small intestines, which form in the substance of the mesentery a series of arches before they end in the wall of the intestines; an *ileocolic* branch to the end of the ileum, the caecum, and beginning of the colon; a *right colic* branch to the ascending colon; and a *middle colic* branch to the transverse colon.

The *inferior mesenteric* artery gives off a *left colic* branch to the descending colon, a *sigmoid* branch to the iliac and pelvic colon, and ends in the superior *haemorrhoidal* artery, which supplies the rectum. The arteries which supply the coats of the alimentary tube from the oesophagus to the rectum anastomose freely with each other in the wall of the tube, or in its mesenteric attachment, and the anastomoses are usually by the formation of arches or loops between adjacent branches.

The *capsular arteries*, small in size, run outward from the aorta to end in the supra-renal capsules.

The *renal* arteries pass one to each kidney, in which they for the most part end, but in the substance of the organ they give off small *perforating* branches, which pierce the capsule of the kidney, and are distributed in the surrounding fat. Additional renal arteries are fairly common.

The *spermatic* arteries are two long slender arteries, which descend, one in each spermatic cord, into the scrotum to supply the testicle. The corresponding ovarian arteries in the female do not leave the abdomen.

Parietal branches.

The branches of the aorta which supply the walls of the thorax, abdomen and pelvis, are the intercostal, the lumbar, the phrenic, and the middle sacral.

The *intercostal* arteries arise from the back of the thoracic aorta, and are usually nine pairs. They run round the sides of the vertebral bodies as far as the commencement of the intercostal spaces, where each divides into a *dorsal* and a *proper intercostal* branch; the dorsal branch passes to the back of the thorax to supply the deep muscles of the spine; the proper intercostal branch (AB.) runs outward in the intercostal space to supply its muscles, and the lower pairs of intercostals also give branches to the diaphragm and wall

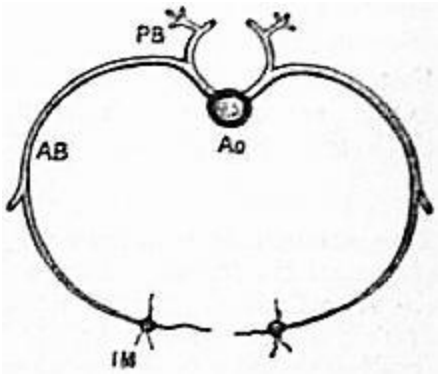


FIG. 1.—Diagram of a pair of intercostal arteries.

Ao, The aorta transversely divided, giving off at each side an intercostal artery.
PB, The posterior or dorsal branch.
AB, The anterior or proper intercostal branch.

of the abdomen. Below the last rib a subcostal artery runs.

IM, A transverse section through the internal mammary artery.

The *lumbar* arteries arise from the back of the abdominal aorta, and are usually four pairs. They run round the sides of the lumbar vertebrae, and divide into a *dorsal* branch which supplies the deep muscles of the back of the loins, and an *abdominal* branch which runs outward to supply the wall of the abdomen. The distribution of the lumbar and intercostal arteries exhibits a transversely segmented arrangement of the vascular system, like the transversely segmented arrangement of the bones, muscles and nerves met with in these localities, but more especially in the thoracic region.

The *phrenic* arteries, two in number, pass to supply the under surface of the diaphragm.

The *middle sacral* artery, as it runs down the front of the sacrum, gives branches to the back of the pelvic wall.

Injections made by Sir W. Turner have shown that, both in the thoracic and abdominal cavities, slender anastomosing communications exist between the visceral and parietal branches.

The arteries to the pelvis and hind limbs begin at the bifurcation of the aorta into the two common iliacs.

Iliac system.

The *common iliac* artery, after a short course, divides into the internal and external iliac arteries. The *internal iliac* enters the pelvis and divides into branches for the supply of the pelvic walls and viscera, including the organs of generation, and for the great muscles of the buttock. The *external iliac* descends behind Poupart's ligament into the thigh, where it takes the name of *femoral* artery. The femoral descends along the front

and inner surface of the thigh, gives off a *profunda* or deep branch, which, by its *circumflex* and *perforating* branches, supplies the numerous muscles of the thigh; most of these extend to the back of the limb to carry blood to the muscles situated there. The femoral artery then runs to the back of the limb in the ham, where it is called *popliteal* artery. The popliteal divides into two branches, of which one, called *anterior tibial*, passes between the bones to the front of the leg, and then downward to the upper surface of the foot; the other, *posterior tibial*, continues down the back of the leg to the sole of the foot, and divides into the *internal* and *external plantar* arteries; branches proceed from the external plantar artery to the sides of the toes, and constitute the *digital* arteries. From the large arterial trunks in the leg many branches proceed, to carry blood to the different structures in the limb.

The wall of an artery consists of several coats (see fig. 2). The outermost is the *tunica adventitia*, composed of connective tissue; immediately internal to this is the *yellow elastic* coat; within this again the *muscular coat*, formed of involuntary. muscular tissue, the contractile fibre-cells of which are for the most part arranged transversely to the long axis of the artery; in the larger arteries the elastic coat is much thicker than the muscular, but in the smaller the muscular coat is relatively strong; the vaso-motor nerves terminate in the muscular coat. In the first part of the aorta, pulmonary artery and arteries of the retina there is no muscular coat. Internal to the muscular coat is the *elastic fenestrated coat*, formed of a smooth elastic membrane perforated by small apertures. Most internal of all is a layer of *endothelial cells*, which form the free surface over which the blood flows. The arteries are not nourished by the blood which flows through them, but by minute vessels, *vasa vasorum*, distributed in their external, elastic and muscular coats.

Structure of arteries.

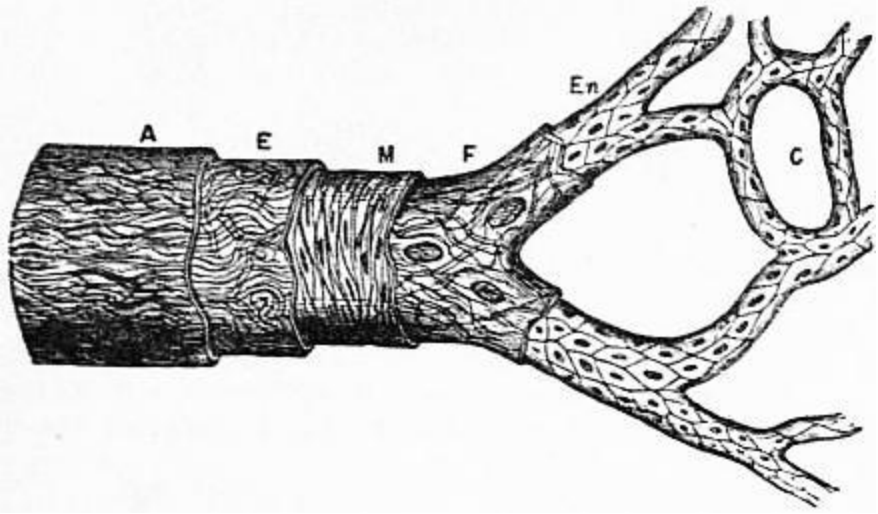


FIG. 2.—Diagram of the structure of an artery. A, tunica adventitia; E, elastic coat; M, muscular coat; F, fenestrated coat; En, endothelium continuous with the endothelial wall of C, the capillaries.

EMBRYOLOGY

The earliest appearance of the blood vessels is dealt with under VASCULAR SYSTEM. Here will be briefly described the fate of the main vessel which carries the blood away from the truncus arteriosus of the developing heart (*q.v.*). This ventral aorta, if traced forward, soon divides into two lateral parts, the explanation being that there were originally two vessels, side by side, which fused to form the heart, but continued separate anteriorly. The two parts run for a little distance toward the head of the embryo, ventral to the alimentary canal, and then turn toward the dorsum, passing one on either side of that tube to form the first aortic arch. Having reached the dorsum they turn backward toward the tail end and form the dorsal aortae; here, according to A.H. Young (*Studies in Anatomy*, Owens College, 1891 and 1900) they again turn toward the ventral side and become, after a

transitional stage, the *hypogastric, placental, allantoic* or *umbilical* arteries. This authority does not believe that the middle sacral artery of the adult is the real continuation of the single median dorsal aorta into which the two parallel dorsal vessels just mentioned soon coalesce, though until recently it has always been so regarded. The anterior loop between the ventral and dorsal aortae already described as the first aortic arch is included in the *maxillary* or *first visceral arch* of the soft parts (see fig. 3, *1*). Later, four other well-marked aortic arches grow behind this in the more caudal visceral arches, so that there are altogether five arterial arches on each side of the pharynx, through which the blood

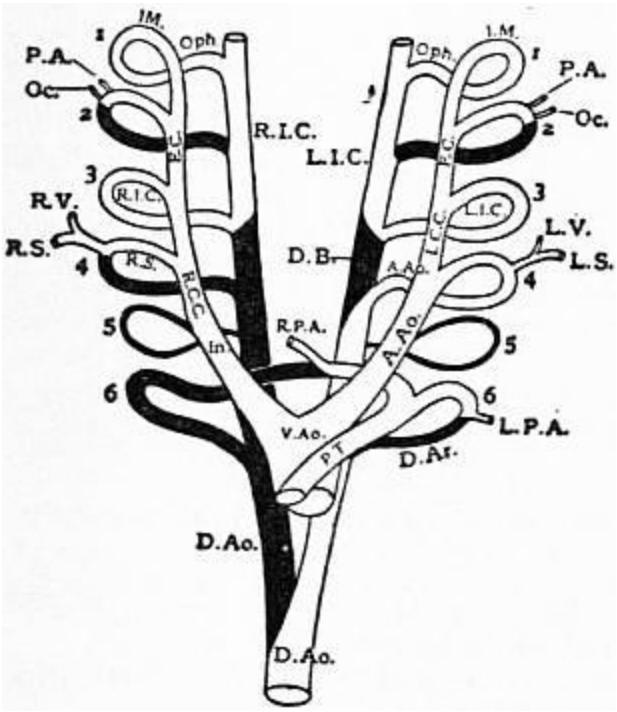


FIG. 3.—Diagram of the Embryonic Arterial Arches. 1, 2, 3, 4, 5, 6, point to the six arches. (The black parts are obliterated in the adult human subject.)

V.Ao. Ventral Aorta.
A.Ao. Arch of Aorta.
D.Ar. Ductus Arteriosus.
In. Innominate Artery.
R.I.C.-L.I.C. Right and Left Internal Carotid Arteries.
D.B. Duct of Botalli.
R.S.-L.S. Right and Left Subclavian Arteries.
R.V.-L.V. Right and Left Vertebral Arteries.
P.A. Posterior Auricular Artery.
Oph. Ophthalmic Artery.
D.Ao. Dorsal Aorta.
P.T. Pulmonary trunk.
R.P.A.-L.P.A. Right and Left Pulmonary Arteries.

R.C.C.-L.C.C. Right and Left Common Carotid Arteries.
E.C. External Carotid Artery.
Oc. Occipital Artery.
I.M. Internal Maxillary Artery.

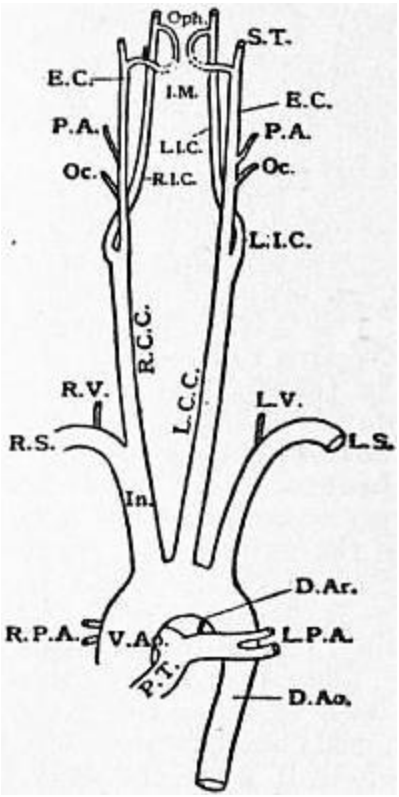


FIG. 4.—Diagram of the Human Aorta and its branches. S.T., Superficial Temporal Artery.

can pass from the ventral to the dorsal aorta. Of these arches the first soon disappears, but is probably partly represented in the adult by the *internal maxillary* artery, one branch of which, the *infraorbital*, is enclosed in the upper jaw, while another, the *inferior dental*, is surrounded by the lower jaw. Possibly the ophthalmic artery also belongs to this arch. The second arch also disappears, but the *posterior auricular* and *occipital* arteries probably spring from it, and at an early period it passed through the stapes as the transitory stapedial artery. The third arch forms the beginning of the internal carotid. The fourth arch becomes the arch of the adult aorta, between the origins of the left carotid and left subclavian, on the left side, and the first part of the right subclavian artery on the right. The apparent fifth arch on the left side (fig. 3, *6*) remains all through foetal life as the *ductus arteriosus*, and, as the lungs develop, the *pulmonary* arteries are derived from it. J.E.V. Boas and W.

Zimmermann have shown that this arch is in reality the sixth, and that there is a very transitory true fifth arch in front of it (fig. 3, *5*). The part of the ventral aorta from which this last arch rises is a single median vessel due to the same fusion of the two primitive ventral aortae which precedes the formation of the heart, but a spiral septum has appeared in it which divides it in such a way that while the anterior or cephalic arches communicate with the left ventricle of the heart, the last one communicates with the right (see HEART). The fate of the ventral and dorsal longitudinal vessels must now be followed. The fused part of the two ventral aortae, just in front of the heart, forms the ascending part of the adult aortic arch, and where this trunk divides between the fifth and fourth arches (strictly speaking, the sixth and fifth), the right one forms the *innominate* (fig. 3, In.) and the left one a very short part of the *transverse arch* of the aorta until the fourth arch comes off (see fig. 4). From this point to the origin of the third arch is *common carotid*, and after that, to the head, *external carotid* on each side. The *dorsal longitudinal* arteries on the head side of the junction with the third arch form the *internal carotids*. Between the third and fourth arches they are obliterated, while on the caudal side of this, until the point of fusion is reached on the dorsal side of the heart, the left artery forms the upper part of the dorsal aorta while the right entirely disappears. Below this point the *thoracic* and *abdominal aortae* are formed by the two *primitive dorsal aortae* which have fused to form a single median vessel. As the limbs are developed, vessels bud out in them. The *subclavian* for the arm comes from the fourth aortic arch on each side, while in the leg the main artery is a branch of the *caudal arch* which is curving ventralward to form the umbilical artery. From the convexity of this arch the internal iliac and sciatic at first carry the blood to the limb, as they do permanently in reptiles, but later the external iliac and femoral become developed, and, as they are on the concave side of the

bend of the hip, while the sciatic is on the convex, they have a mechanical advantage and become the permanent main channel.

For further details see O. Hertwig, *Handbuch der vergleichenden und experimentellen Entwickelungslehre der Wirbeltiere* (Jena, 1905).

Comparative Anatomy

In the Acrania the lancelet (Amphioxus) shows certain arrangements of its arteries which are suggestive of the embryonic stages of the higher vertebrates and Man. There is a median ventral aorta below the pharynx, from which branchial arteries run up on each side between the branchial clefts, where the blood is aerated, to join two dorsal aortae which run back side by side until the hind end of the pharynx is reached; here they fuse to form a median vessel from which branches are distributed to the straight intestine. There is no heart, but the ventral aorta is contractile, and the blood is driven forward in it and backward in the dorsal aortae. The branchial arteries are very numerous, and cannot be homologized closely with the five (originally six) pairs of aortic arches in Man.

In the fish the ventral aorta gives rise to five afferent branchial arteries carrying the blood to the gills, though these may not all come off as independent trunks from the aorta. From the gills the afferent branchials carry the blood to the median dorsal aorta. As pectoral and pelvic fins are now developed, subclavian and iliac arteries are found rising from the dorsal aorta, though the aorta itself is continued directly backward as the caudal artery into the tail. In the Dipnoi or mud fish, in which the swim bladder is converted into a functional lung, the hindmost afferent branchial artery, corresponding to the fifth (strictly

speaking the sixth) aortic arch of the human embryo, gives off on each side a pulmonary artery to that structure.

The arrangement of the branchial aortic arches in the tailed Amphibia (Urodela), and in the tadpole stage of the tailless forms (Anura), makes it probable that the generalized vertebrate has six (if not more) pairs of these instead of the five which are evident in the human embryo. Four pairs of arches are present, the first of which is the carotid and corresponds to the third of Man; the second is the true aortic arch on each side; the third undergoes great reduction or disappears when the gills atrophy, and is very transitory in the Mammalia (fig. 3, *5*), while the fourth is the one from which the pulmonary artery is developed when the lungs appear, and corresponds to the nominal fifth, though really the sixth arch, of the higher forms (fig. 3, *6*). The dorsal part of this sixth arch remains as a pervious vessel in the Urodela, joining the pulmonary arch to the dorsal aorta. In the central part of the carotid arch the vessel breaks up into a plexus, for a short distance forming the so-called carotid gland, which has an important effect upon the adult circulation of the Amphibia. In the Reptilia the great arteries are arranged on the same plan as in the adult Amphibia, but the carotid arch retains its dorsal communication with the systematic aortic arch on each side, and this communication is known as the duct of Botalli (fig. 3, D.B.). In this class, as in the Amphibia, one great artery, the coeliaco-mesenteric, usually supplies the liver, spleen, stomach and anterior part of the intestines; this is a point of some interest when it is noticed how very close together the coeliac axis and superior mesenteric arteries rise from the abdominal aorta in Man.

In the Birds the right fourth arch alone remains as the aorta, the dorsal part of the left corresponding arch being obliterated. From the

arch of the aorta rise two symmetrical innominates, each of which divides later into a carotid and subclavian. The blood path from the aorta to the hind limb in the Amphibia, Reptilia and Aves, is a dorsal one, and passes through the internal iliac and sciatic to the back of the thigh, and so to the popliteal space; the external iliac is, if it is developed at all, only a small branch to the pelvis.

In the Mammalia the fourth left arch becomes the aorta, the corresponding right one being obliterated, but several cases have been recorded in Man in which both arches have persisted, as they do in the reptiles (H. Leboucq, *Ann. Sci. Med. Gand*, 1894, p. 7). Examples have also been found of a right aortic arch, as in birds, while a very common human abnormality is that in which the dorsal part of the fourth right arch persists, and from it the right subclavian artery arises (see fig. 3).

The commonest arrangement of the great branches of the aortic arch in Mammals is that in which the innominate and left carotid arise by a single short trunk, while the left subclavian comes off later; this is also Man's commonest abnormality. Sometimes, especially among the Ungulata, all the branches may rise from one common trunk; at other times two innominate arteries may be present; this is commonest in the Cheiroptera, Insectivora and Cetacea. It is extremely rare to find all four large arteries rising independently from the aorta, though it has been seen in the Koala (F.G. Parsons, "Mammalian Aortic Arch," *Journ. of Anat.* vol. xxxvi. p. 389). The human arrangement of the common iliacs is not constant among mammals, for in some the external and internal iliacs rise independently from the aorta, and this is probably the more primitive arrangement. The middle sacral artery has already been referred to. A.H. Young and A. Robinson believe, on embryological grounds, that this artery in mammals is not homologous with the caudal artery of the fish, and is not the direct continuation of

the aorta; it is an artery which usually gives off two or more collateral branches, and sometimes, as in the Ornithorynchus and some edentates, breaks up into a network of branches which reunite and so form what is known as a *rete mirabile*. These retia mirabilia are often found in other parts of the mammalian body, though their function is still not satisfactorily explained. The way in which the blood is carried to the foot in the pronograde mammals differs from that of Man; a large branch called the internal saphenous comes off the common femoral in the lower third of the thigh, and this runs down the inner side of the leg to the foot. This arrangement is quite convenient as long as the knee is flexed, but when it comes to be extended, as in the erect posture, the artery is greatly stretched, and it is much easier for the blood to pass to the foot through the anterior and posterior tibials. A vestige of this saphenous artery, however, remains in Man as the anastomotica magna.

The literature of the Comparative Anatomy of the Arteries up to 1902 will be found in R. Wiedersheim's *Vergleichende Anatomie der Wirbeltiere* (Jena, 1902). The morphology of the Iliac Arteries is described by G. Levi, *Archivio Italiano di Anat. ed Embriol.*, vol. i. (1902).

ARTERN, a town of Germany, in Prussian Saxony, on the Unstrut, at the influx of the Helme, at the junction of railways to Erfurt, Naumburg and Sangerhausen, 8 m. S. of the last named. Pop. 5000. It has an Evangelical church, an agricultural college and some manufactures of machinery, sugar and boots. Its brine springs, known as early as the 15th century, are still frequented.

ARTESIAN WELLS, the name properly applied to water-springs rising above the surface of the ground by natural hydrostatic pressure, on boring a small hole down through a series of strata to a water-carrying bed enclosed between two impervious layers; the name is, however, sometimes loosely applied to any deep well, even when the water is obtained by pumping. In Europe this mode of well-boring was first practised in the French province of Artois, whence the name of Artesian is derived. At Aire, in that province, there is a well from which the water has continued steadily to flow to a height of 11 feet above the ground for more than a century; and there is, within the old Carthusian convent at Lillers, another which dates from the 12th century, and which still flows. But unmistakable traces of much more ancient bored springs appear in Lombardy, in Asia Minor, in Persia, in China, in Egypt, in Algeria, and even in the great desert of Sahara. (See WELL.)

ARTEVELDE, JACOB VAN (*c.* 1290-1345), Flemish statesman, was born at Ghent about 1290. He sprang from one of the wealthy commercial families of this great industrial city, his father's name being probably William van Artevelde. His brother John, a rich cloth merchant, took a leading part in public affairs during the first decades of the 14th century. Jacob, who according to tradition was a brewer by trade, spent three years in amassing quietly a large fortune. He was twice married, the second time to Catherine de Coster, whose family was of considerable influence in Ghent. Not till 1337, when the outbreak of hostilities between France and England threatened to injure seriously the industrial welfare of his native town, did Jacob van Artevelde make his first appearance as a political leader. As the Flemish cities depended upon England for the supply of the wool for their staple industry of weaving, he boldly came forward, as a tribune of the people, and at a great meeting at the monastery of Biloke unfolded his scheme of an alliance of the Flemish towns, with those of Brabant, Holland and Hainaut, to maintain an armed neutrality in the dynastic struggle between Edward III. and Philip VI. of France. His efforts were successful. Bruges, Ypres and other towns formed a league with Ghent, in which town Artevelde, with the title of captain-general, henceforth until his death exercised almost dictatorial authority. His first step was to conclude a commercial treaty with England. The efforts of the count of Flanders to overthrow the power of Artevelde by force of arms completely failed, and he was compelled at Bruges to sign a treaty (June 21, 1338) sanctioning the federation of the three towns, Ghent, Bruges and Ypres, henceforth known as the "Three members of Flanders." This was the first of a series of treaties, made during the year 1339-1340, which gradually brought into the federation all the towns and provinces of the Netherlands. The policy of neutrality, however, proved impracticable, and the Flemish towns, under the leadership of Artevelde, openly took the side of the English king, with whom a close alliance was concluded. Artevelde now reached the height of his power, concluding alliances with kings, and publicly associating with them on equal terms. Under his able administration trade flourished, and Ghent rose rapidly in wealth and importance. His well-nigh despotic rule awoke at last among his compatriots jealousy and resentment. The proposal of Artevelde to disown the sovereignty of Louis, count of Flanders, and to recognize in its place that of Edward, prince of Wales (the Black Prince), gave rise to violent dissatisfaction. A popular insurrection broke out in Ghent, and Artevelde fell into the hands of the crowd and was murdered on the 24th of July 1345.

The great services that he rendered to Ghent and to his country have in later times been recognized. A statue was erected in his native town on the Marché du Vendredi, and was unveiled by Leopold I., king of the Belgians, on the 13th of September 1863.

See J. Hutten, *James and Philip van Artevelde* (London, 1882); W.J. Ashley, *James and Philip van Artevelde* (London, 1883); P. Namèche, *Les van Artevelde et leur époque* (Louvain, 1887); L. Vanderkindere, *Le Siècle des Arteveldes* (Brussels, 1879).

ARTEVELDE, PHILIP VAN (*c.* 1340-1382), youngest son of the above, and godson of Queen Philippa of England, who held him in her arms at his baptism, lived in retirement until 1381. The Ghenters had in that year risen in revolt against the oppression of the count of Flanders, and Philip, now forty years of age, and without any military or political experience, was offered the supreme command. His name awakened general enthusiasm. At first his efforts were attended by considerable success. He defeated Louis de Mâle, count of Flanders, before Bruges, entered that city in triumph, and was soon master of all Flanders. But France took up the cause of the Flemish count, and a splendid French army was led across the frontier by the young king Charles VI. in person. Artevelde advanced to meet the enemy at the head of a burgher army of some 50,000 Flemings. The armies met at Roosebeke near Courtrai, with the result that the Flemings were routed with terrible loss, Philip himself being among the slain. This happened on the 27th of November 1382.

The brief but stirring career of this popular leader is admirably treated in Sir Henry Taylor’s drama, *Philip van Artevelde*.

ART GALLERIES. An art gallery (by which, as distinguished from more general MUSEUMS OF ART, *q.v.*, is here meant one specially for pictures) epitomizes so many phases of human thought and imagination that it connotes much more than a mere collection of paintings. In its technical and aesthetic aspect the gallery shows the treatment of colour, form and composition. In its historical aspect we find the true portraits of great men of the past; we can observe their habits of life, their manners, their dress, the architecture of their times, and the religious worship of the period in which they lived. Regarded collectively, the art of a country epitomizes the whole development of the people that produced it. Most important of all is the emotional aspect of painting, which must enter less or more into every picture worthy of notice. To take examples from the British National Gallery: pathos in its most intense degree will be found in Francia's "Pietà"; dignity in Velasquez' portrait of Admiral Pareja; homeliness in Van Eyck's portrait of Jan Arnolfini and his wife; the interpretation of the varying moods of nature in the work of Turner or Hobbema; nothing can be more devotional than the canvases of Bellini or his Umbrian contemporaries. So also the ruling sentiments of mankind—mysticism, drama and imagination—are the keynotes of other great conceptions of the artist. All this may be at the command of those who visit the art gallery; but without patience, care and study the higher meaning will be lost to the spectator. The picture which "tells its own story" is often the least didactic, for it has no inner or deeper lesson to reveal; it gives no stimulus or training to the eye, quick as that organ may be—*segnius irritant animos*—to translate sight into thought. In brief, the painter asks that his ἦθος may be shared as much as possible by the man who looks at the painting—the art above all others in which it is most needful to share the master's spirit if his work is to be fully appreciated. So, too, the art gallery, recalling the gentler associations of the past amidst surroundings of harmonious beauty and its attendant sense of comfort, is essentially a place of rest for the mind and eye. In the more famous galleries where the wealth of paintings allows a grouping of pictures according to their respective schools, one may choose the country, the epoch, the style or even the emotion best suited to one's taste. According to this theory, though imperfectly realized owing to the paucity of examples, the philosophic influence of art galleries is becoming more widely extended; and in its further development will be found an ever-growing source of interest, instruction and scholarship to the community. The most suitable method of describing art galleries is to classify them by their types and contents rather than by the various countries to which they belong. Thus the great representative galleries of the world which possess works of every school are grouped

together, followed by state galleries which are not remarkable for more than one school of national art. Municipal galleries are divided into those which have general collections, and those which are notable for special collections. Churches which have good paintings, together with those which are now secularized, are treated separately; while the collections in the Vatican and private houses are described together. The remaining galleries, such as the Salon or the Royal Academy, are periodical or commercial in character, and are important in the development of modern art.

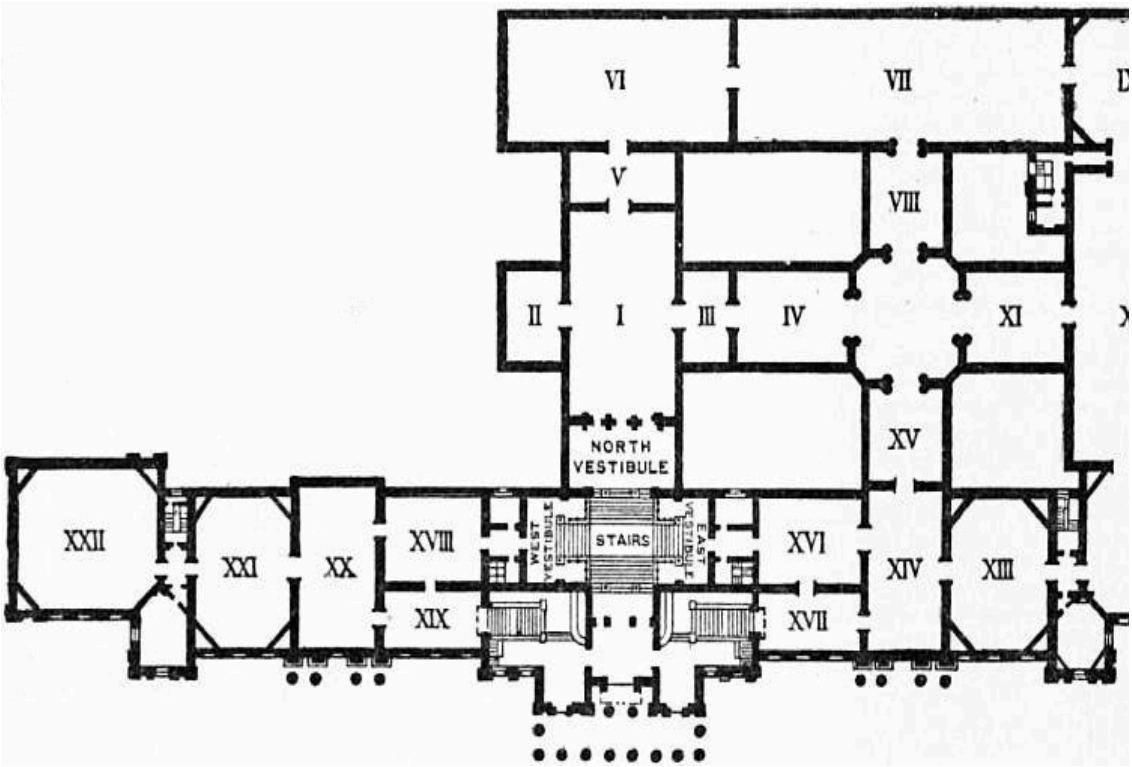


FIG. 1.—Plan of the National Gallery, London.

North Vestibule, Early Italian Schools:

I. Tuscan School (15th and 16th centuries).
II. Sienese School, &c.
III. Tuscan School.
IV. Lombard School.
V. Ferrarese and Bolognese Schools.
VI. Umbrian School, &c.
VIII. Paduan and Early Venetian Schools.
IX. Later Venetian School.
X. Flemish School.
XI. Early Dutch and Flemish Schools.
XII. Dutch and Flemish Schools.
XIII. Flemish School.
XIV. Spanish School.
XV. German Schools.
XVI. French School.
XVII. French School.
XVIII. British School.
XIX. Old British School.
XX. British School.
XXI. British School.
XXII. Turner Collection.
Octagonal Hall: Miscella
East Vestibule: British Sc
West Vestibule: Italian Sc

VII. Venetian and Brescian Schools.

The collections most worthy of attention are the state galleries representative of international schools. Among these the British National Gallery holds a high place. The collection was founded in 1824 by the acquisition of the Angerstein pictures. Its accessions are mainly governed by the parliamentary grant of £5000 to £10,000 a year, a sum which has occasionally been enlarged to permit special purchases. Thus, in 1871, the Peel collection of seventy-seven pictures was bought for £75,000, and in 1885 the Ansidei Madonna (Raphael) and Van Dyck's portrait of Charles I. were bought, the one for £70,000 and the other for £17,500. In 1890 the government gave £25,000 to meet a gift of £30,000 made by three gentlemen to acquire three portraits by Moroni, Velazquez and Holbein. The most important private gifts were the Vernon gift in 1847, the Turner bequest in 1856 and the Wynne-Ellis legacy in 1876. Since 1905 the Art Collections Fund, a society of private subscribers, has also been responsible for important additions to the gallery, notably the Venus of Velazquez (1907). The gallery contains very few poor works and all schools are well represented, with the sole exception of the French school. This, however, can be amply studied at Hertford House (Wallace Collection), which, besides Dutch, Spanish and British pictures of the highest value, contains twenty examples of Greuze, fifteen by Pater, nineteen by Boucher, eleven by Watteau and fifteen by Meissonier. The national gallery of pictures at Berlin (Kaiser Friedrich Museum), like the British National Gallery, is remarkable for its variety of schools and painters, and for the select type of pictures shown. During the last twenty-five years of the 19th century, the development of this collection was even more striking than that of the English gallery. Italian and Dutch examples are specially numerous, though every school but the British (here as elsewhere) is really well seen. The purchase grant is considerable, and is well applied. Two other German capitals have collections of international importance—Dresden and Münich. The former is famous for the Sistine Madonna by Raphael, a work of such supreme excellence that there is a tendency to overlook other Italian pictures of celebrity by Titian, Giorgione and Correggio. Münich (Old Pinakothek) has examples of all the best masters, the South German school being particularly noticeable. The arrangement is good, and the methods of exhibition make this one of the most pleasant galleries on the continent.

State galleries of international schools.

Vienna has the Imperial Gallery, a collection which in point of number cannot be considered large, as there are not more than 1700 pictures. This, however, is in itself a safeguard, like the wise provision in a statute of 1856 for enabling the English authorities to dispose of pictures "unfit for the collection, or not required." It avoids the undue multiplication of canvases, and the overcrowding so noticeable in many Italian galleries where first-rate pictures hang too high to be examined. Thus the Viennese gallery, besides the intrinsic value of its pictures (Albert Durer's chief work is there), is admirably adapted for study. The best gallery in Russia (St Petersburg, Hermitage) was made entirely by royal efforts, having been founded by Peter the Great, and much enlarged by the empress Catherine. It contains the collections of Crozat, Brühl and Walpole. There are about 1800 works, the schools of Flanders and Italy being of signal merit; and there are at least thirty-five genuine examples by Rembrandt. The French collection (Louvre Palace, Paris) is one of the most important of all. In 1880 it was undoubtedly the first gallery in Europe, but its supremacy has since been menaced by other establishments where acquisitions are made more frequently and with greater care, and where the system of classification is such that the value of the pictures is enhanced rather than diminished by their display. In 1900 it was partly rearranged with great effect. The feature of the Louvre is the Salon Carré, a room in which the supposed finest canvases in the collection are kept together, pictures of world-wide fame, representing all schools. It is now generally accepted that this system of selection not only lowers the standard of individual schools elsewhere by withdrawing their best pictures, but does not add to the aesthetic or educational value of the masterpieces themselves. In Florence the Tribuna room of the Uffizi gallery is a similar case in point. Probably the two most widely known pictures in the Louvre are Watteau's second "Embarquement pour Cythère," and the "Monna Lisa," a portrait by Leonardo da Vinci, but each school has many unique examples. The original drawings should be noted, being of equal importance to the collection preserved at the British Museum. The last collection to be mentioned under this heading is that known as the Royal Galleries in Florence, housed in the Pitti and Uffizi palaces. In some ways this collection does not represent general painting sufficiently to justify its inclusion with the galleries of Berlin, Paris and London. On the other hand, the great number of Italian pictures of vital importance to the history of international art makes this one of the finest existing collections. The two great palaces, dating from the 15th and 16th centuries, are joined together and contain the Medici pictures. They form the largest gallery in the world, and though many of the rooms are small and badly lighted, and

although many paintings have suffered from thoughtless restoration, they have a charm and attraction which certainly make them the most popular galleries in Europe. The Pitti has ten Raphaels and excellent examples of Andrea del Sarto, Giorgione and Perugino. The Uffizi is more representative of non-Italian schools, but is best known for its works by Botticelli, Leonardo da Vinci, Michelangelo and Sodoma, the schools of Tuscany and Umbria forming the bulk of both collections. Admission to the galleries is by payment, and the small income derived from this source is devoted to maintaining and enlarging the collections.

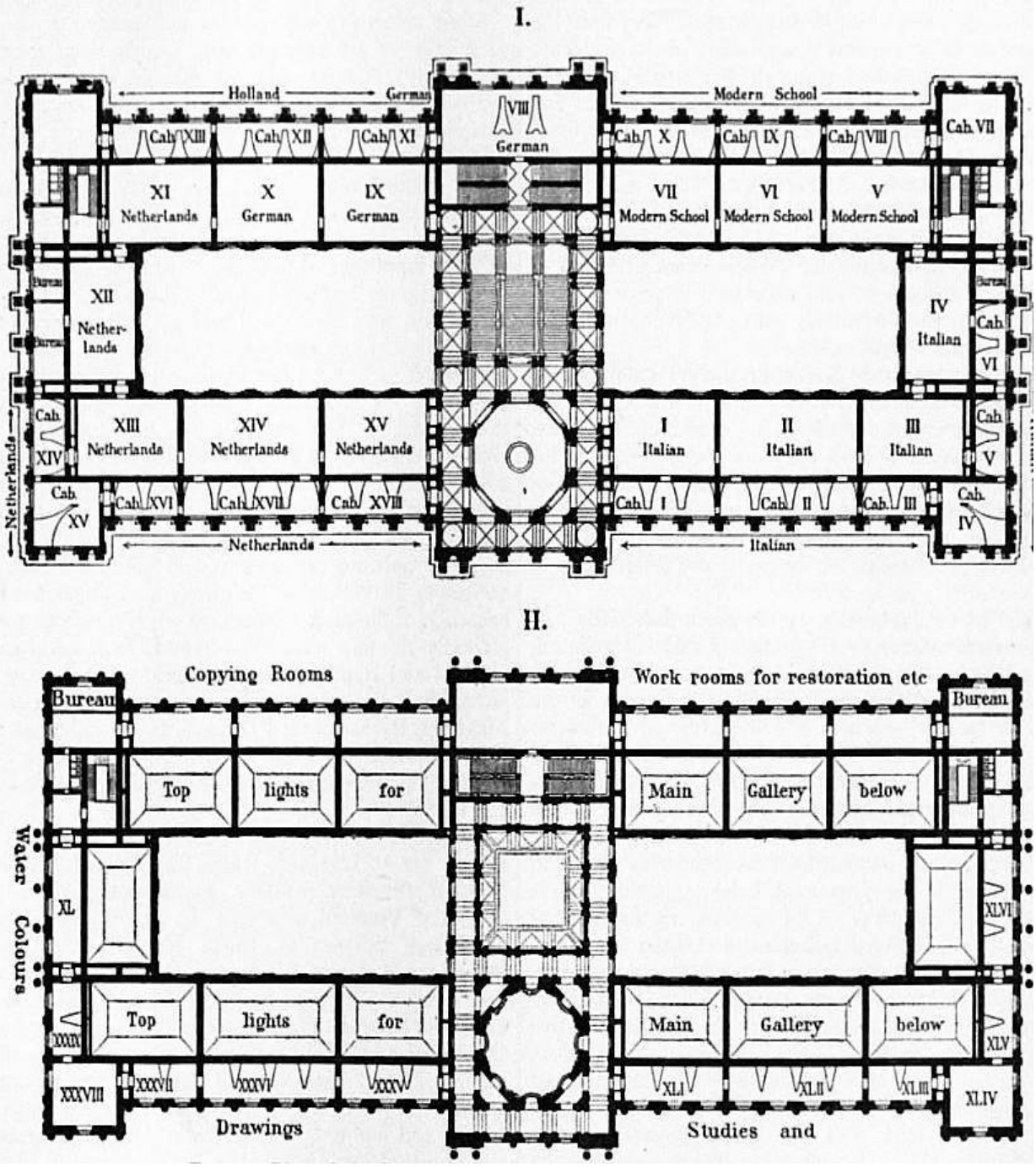


FIG. 2.—Plan of the first and second floors of the Imperial Gallery, Vienna.

As to the ground plans of the National Gallery, London (fig. 1), and of the Imperial Gallery at Vienna (fig. 2), it will be observed that while the former has the advantage of uniform top-light, the galleries at Vienna possess the most ample facilities for minute classification, small rooms or "cabinets" opening from each large room. Special rooms

are also provided for drawings and water-colours, while special ranges of rooms are used by copyists and those responsible for the repair and preservation of the pictures.

Though not so comprehensive as the great collections just described, the state galleries showing national schools of painting and little else are of striking interest. In England the National Gallery of British Art (known as the Tate Gallery) contains British pictures. The corresponding collection of modern French art is at Paris (Luxembourg Palace), Berlin, Rome, Dresden, Vienna and Madrid having analogous galleries. The Victoria and Albert Museum has also numerous British pictures, especially in water-colour, and the National Portrait Gallery, founded in 1856, and since 1896 housed in its permanent home, is instructive in this connexion, though many of its pictures are the work of foreign artists. The national collections at Dublin and Edinburgh may be mentioned here, though most schools are represented. Brussels and Antwerp are remarkable for fine examples of Flemish art—Matsys, Memlinc and Van Eyck of the primitive schools, Rubens and Van Dyck of the later period. The collections at Amsterdam (Ryks Museum) and the Hague (Mauritshuis) are a revelation to those who have only studied Rembrandt, Franz Hals, Van der Helst, and other Dutch portrait painters outside Holland; and in the former gallery especially, the pictures are arranged in a manner showing them to the best advantage. The Museo del Prado is even more noteworthy, for the fifty examples of Velasquez (outrivalling the Italian pictures, important as they are) make a visit to Madrid imperative to those who wish to realize the achievements of Spanish art. Christiania, Stockholm and Copenhagen have large collections of Scandinavian art, and the cities of Budapest and Basel have galleries of some importance. In Italy the state maintains twelve collections, mainly devoted to pictorial art. Of these the best are situated at Bologna, Lucca, Parma, Venice, Modena, Turin and Milan. In each case the local school of painting is fully represented. In Rome the Corsini and Borghese Galleries, the latter being the most catholic in the city, contain superb examples, some of them accepted masterpieces of Italian art; there are also good foreign pictures, but their number is limited. The Accademia at Florence should also be noted as the most important state gallery of early Italian art. The central Italian Renaissance can be more adequately studied here than in the Pitti. The “Primavera” of Botticelli, and the “Last Judgment” by Fra Angelico are perhaps the best-known works. The large statue of David by Michelangelo is also in this gallery, which, on the whole, is one of the most remarkable in Italy. Speaking broadly, these

State galleries of national schools.

national galleries scattered throughout the country are not well arranged or classified; and though some are kept in fine old buildings, beautiful in themselves, the lighting is often indifferent, and it is with difficulty that the pictures can be seen. In nearly every case admission fees are charged every day, festivals and Sundays excepted; few pictures are bought, acquisitions being chiefly made by removing pictures from churches.

Many towns own collections of well-merited repute. In Italy such galleries are common, and among them may be noted Siena, with Sodoma and his school; Venice with Tintoretto (Doge's Palace); Genoa, with the great palaces Balbi and Rosso; Vicenza (Montagna and school), Ferrara (Dosso and school), Bergamo and Milan (north Italian schools). Other civic collections of Italian art are maintained at Verona, Pisa, Rome, Perugia and Padua. In Holland, Haarlem, Leiden, Rotterdam and the Hague have galleries supplemental to those of the state, and are remarkable in showing the brilliance of artists like Grebber, de Bray and Ravesteyn, who are usually ignored. Birmingham and Manchester have good examples of modern British art. Moscow (Tretiakoff collection) has modern Russian pictures, and contemporary German and French work will be found in all the galleries of these two countries included in the municipal group. Collections of French work are found at Amiens, Rouen, Nancy, Tours, Le Mans and Angers, but large as these civic collections are, sometimes containing six and eight hundred canvases, few of their pictures are really good, many being the enormous patriotic canvases marked "Don de l'État," which do not confer distinction on the galleries. Cologne has the central collection of the early Rhenish school; Nuremberg is remarkable for early German work (Wohlgemut, &c.). Stuttgart, Cassel (Dutch) and Hamburg (with a considerable number of British pictures) are also noteworthy, together with Brunswick, Hanover, Augsburg, Darmstadt and Düsseldorf, where German and Dutch art preponderate. Seville is famous for twenty-five examples of Murillo, and there are old Spanish paintings at Valencia, Cordova and Cadiz.

Municipal galleries of special schools.

In Great Britain the best of the municipal galleries of general schools are at Liverpool (early Flemish and British), and at Glasgow (Scottish painters, Rembrandt, Van der Goes and Venetian schools). In France there are very large galleries at Tours, Montpellier, Lyons (Perugino, Rubens), Dijon and Grenoble (Italian), Valenciennes (Watteau and school), while Rennes, Lille and Marseilles have first-rate collections. Nantes, Orleans, Besançon, Cherbourg and Caen have also many paintings, French for

Municipal galleries of general schools.

the most part, but with occasional foreign pictures of real importance, presented by the state during the Napoleonic conquests, and not returned on the declaration of peace as were the works of art amassed in Paris. Some of the American collections have in recent years made a great advance in their acquisition of good pictures. At Boston (Museum of Fine Arts) all schools are represented, so too at the Metropolitan Museum of Art in New York, which is strong in Italian and Dutch works. Modern French and Flemish art is a feature of the Academy at Philadelphia, at the Lenox Library (New York), and at Chicago, where there are good examples of Millet, Constable and Rembrandt. The Corcoran bequest at Washington is of minor importance. The best civic collection in Germany of this class is the Städel Institute at Frankfort (Van Eyck, Christus, early Flemish and Italian).

As the great bulk of religious painting was executed for church decoration, there are still numberless churches which may be considered picture galleries. Thus at Antwerp

Churches.

cathedral the Rubens paintings are remarkable; at Ghent, Van Eyck; at Bruges (hospital of St John), Memlinc; at Pisa, the Campo Santo (early Tuscan schools); at Sant' Apollinare, Ravenna, primitive Italo-Byzantine mosaics; at Siena, Pinturichio. Examples could be multiplied indefinitely—in Italy alone there are 80,000 churches and chapels, in all of which pictorial art has been employed. In Italy, besides the church "galleries" still used for religious services, there are some which have been secularized and are now used as museums, *e.g.* Certosa at Pavia, and San Vitale at Ravenna (mosaics); at Florence, the Scalzo (Andrea del Sarto); San Marco (Fra Angelico); the Riccardi and Pazzi chapels (Gozzoli and Perugino); at Milan, in the Santa Maria delle Grazie, the "Last Supper," by Leonardo, and at Padua, the famous Arena chapel (Giotto).

The Vatican galleries, though best known for their statuary, have fine examples of painting, chiefly of the Italian school; the most famous easel picture is Raphael's

Private and semi-private galleries.

"Transfiguration," but the Stanze, apartments entirely decorated by painting, are even more famous. In England three royal palaces are open to the public—Hampton Court (Mantegna), Windsor (Van Dyck, Zuccarelli), and Kensington (portraits). At Buckingham Palace the Dutch pictures are admirable, and Queen Victoria lent the celebrated Raphael cartoons to the Victoria and Albert Museum. Semi-private collections belong to Dulwich College (Velasquez and Watteau), Oxford University (Italian drawings), the

Soane Museum (Hogarth and English school), and the Royal Academy (Leonardo). Among private collections the most important are the Harrach, and Prince Liechtenstein (Vienna), J. Pierpont Morgan (including miniatures), Mrs J. Gardner of Boston (Italian), Prince Corsini (Florence). In Great Britain there are immense riches in private houses, though many collections have been dispersed. The most noteworthy (1909) belong to the dukes of Devonshire and Westminster, Lord Ellesmere, Captain Holford (including the masterpiece of Cuyp), Ludwig Mond, Lord Lansdowne, Miss Rothschild. The finest private collection is at Panshanger, formerly the seat of Lord Cowper, the gallery of Van Dyck's work being quite the best in the world.

Many galleries are devoted to periodical exhibitions in London; the Royal Academy is the leading agency of this character, having held exhibitions since 1769. Its loan exhibitions of Old Masters are most important. Similar enterprises are the New Gallery, opened in 1888, the Grafton Gallery, and others. There are also old-established societies of etchers, water-colourists, &c. A feature common to these exhibitions is that the public always pays for admission, though they differ from the commercial exhibitions, becoming more common every year, in which the work of a single school or painter is shown for profit. But the annual exhibitions at the Guildhall, under the auspices of the corporation, are free. The great periodical exhibition of French art is known as the Salon, and for some years it has had a rival in the Champ de Mars exhibition. These two societies are now respectively housed in the Grand Palais and Petit Palais, in the Champs Elysees, which were erected in connexion with the Paris Exhibition of 1900, but with the ultimate object of being devoted to the service of the two Salons. Berlin, Rome, Vienna and other Continental towns have regular exhibitions of original work.

Periodical and commercial.

The best history of art galleries is found in their official and other catalogues, see article MUSEUMS. See also L. Viardot, *Les Musees d'Italie, &c.* (3 vols., Paris, 1842, 1843, 1844); Annual Reports, official, of National Portrait Gallery, National Galleries of England, Ireland and Scotland; Civil Service Estimates, class iv. official. See also the series edited by Lafenestre and E. Richtenberger: *Le Louvre, La Belgique, Le Hollande, Florence, Belgique*; A. Lavice, *Revue des musees de France,... d'Allemagne,... d'Angleterre,... d'Espagnc,... d'Italie,... de Belgique, de Hollande et de Russie* (Paris, 1862-1872); E. Michel, *Les Musées d'Allemagne* (Paris, 1886); Kate Thompson, *Public Picture Galleries of Europe* (1880); C.L. Eastlake, *Notes on Foreign Picture Galleries*; Lord Ronald Gower, *Pocket Guide*

to Art Galleries (*public and private*) *of Belgium and Holland* (1875); and many works, albums, and so forth, issued mainly for the sake of the illustrations. (B.)

ARTHRITIS (from Gr. ἄρθρον, a joint), inflammation of the joints, in various forms of what are generally called gout and rheumatism (*qq.v.*).

ARTHROPODA, a name, denoting the possession by certain animals of jointed limbs, now applied to one of the three sub-phyla into which one of the great phyla (or primary branches) of coelomocoelous animals—the Appendiculata—is divided; the other two being respectively the Chaetopoda and the Rotifera. The word "Arthropoda" was first used in classification by Siebold and Stannius (*Lehrbuch der vergleich. Anatomie*, Berlin, 1845) as that of a primary division of animals, the others recognized in that treatise being Protozoa, Zoophyta, Vermes, Mollusca and Vertebrata. The names Condylopoda and Gnathopoda have been subsequently proposed for the same group. The word refers to the jointing of the chitinized exo-skeleton of the limbs or lateral appendages of the animals included, which are, roughly speaking, the Crustacea, Arachnida, Hexapoda (so-called "true insects"), Centipedes and Millipedes. This primary group was set up to indicate the residuum of Cuvier's Articulata when his class Annelides (the modern Chaetopoda) was removed from that *embranchement*. At the same time C.T.E. von Siebold and H. Stannius renovated the group Vermes of Linnaeus, and placed in it the Chaetopods and the parasitic worms of Cuvier, besides the Rotifers and Turbellarian worms.[1]

The result of the knowledge gained in the last quarter of the 19th century has been to discredit altogether the group Vermes (see WORM), thus set up and so largely accepted

by German writers even at the present day. We have, in fact, returned very nearly to Cuvier's conception of a great division or branch, which he called Articulata, including the Arthropoda and the Chaetopoda (Annelides of Lamarck, a name adopted by Cuvier), and differing from it only by the inclusion of the Rotifera. The name Articulata, introduced by Cuvier, has not been retained by subsequent writers. The same, or nearly the same, assemblage of animals has been called Entomozoaria by de Blainville (1822), Arthrozoa by Burmeister (1843), Entomozoa or Annellata by H. Milne-Edwards (1855), and Annulosa by Alexander M'Leay (1819), who was followed by Huxley (1856). The character pointed to by all these terms is that of a ring-like segmentation of the body. This, however, is not the character to which we now ascribe the chief weight as evidence of the genetic affinity and monophyletic (uni-ancestral) origin of the Chaetopods, Rotifers and Arthropods. It is the existence in each ring of the body of a pair of hollow *lateral appendages* or *parapodia*, moved by intrinsic muscles and penetrated by blood-spaces, which is the leading fact indicating the affinities of these great sub-phyla, and uniting them as blood-relations. The parapodia (fig. 8) of the marine branchiate worms are the same things genetically as the "legs" of Crustacea and Insects (figs. 10 and 11). Hence the term Appendiculata was introduced by Lankester (preface to the English edition of Gegenbaur's *Comparative Anatomy*, 1878) to indicate the group. The relationships of the Arthropoda thus stated are shown in the subjoined table:—

Phylum—Appendiculata.	Sub-phylum	1. Rotifera.
	"	2. Chaetopoda.
	"	3. Arthropoda.

The ROTIFERA are characterized by the retention of what appears in Molluscs and Chaetopods as an embryonic organ, the velum or ciliated prae-oral girdle, as a locomotor and food-seizing apparatus, and by the reduction of the muscular parapodia to a rudimentary or non-existent condition in all present surviving forms except *Pedalion*. In many important respects they are degenerate—reduced both in size and elaboration of structure.

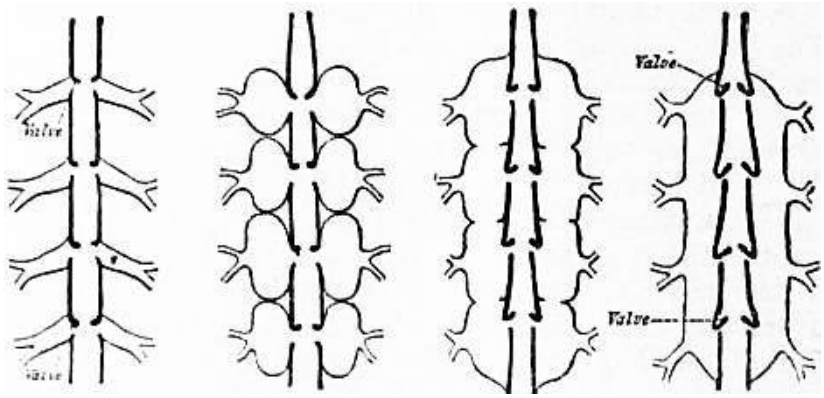
The CHAETOPODA are characterized by the possession of horny epidermic chaetae embedded in the integument and moved by muscles. Probably the chaetae preceded the development of parapodia, and by their concentration and that of the muscular bundles

connected with them at the sides of each segment, led directly to the evolution of the parapodia. The parapodia of Chaetopoda are never coated with dense chitin, and are, therefore, never converted into jaws; the primitive "head-lobe" or prostomium persists, and frequently carries eyes and sensory tentacles. Further, in all members of the sub-phylum Chaetopoda the relative position of the prostomium, mouth and peristomium or first ring of the body, retains its primitive character. We do not find in Chaetopoda that parapodia, belonging to primitively post-oral rings or body-segments (called "somites," as proposed by H. Milne-Edwards), pass in front of the mouth by adaptational shifting of the oral aperture. (See, however, 8.)

The ARTHROPODA might be better called the "Gnathopoda," since their distinctive character is, that one or more pairs of appendages behind the mouth are densely chitinized and turned (fellow to fellow on opposite sides) towards one another so as to act as jaws. This is facilitated by an important general change in the position of the parapodia; their basal attachments are all more ventral in position than in the Chaetopoda, and tend to approach from the two sides towards the mid-ventral line. Very usually (but not in the Onychophora = *Peripatus*) all the parapodia are plated with chitin secreted by the epidermis, and divided into a series of joints—giving the "arthropodous" or hinged character.

There are other remarkable and distinctive features of structure which hold the Arthropoda together, and render it impossible to conceive of them as having a polyphyletic origin, that is to say, as having originated separately by two or three distinct lines of descent from lower animals; and, on the contrary, establish the view that they have been developed from a single line of primitive Gnathopods which arose by modification of parapodiate annulate worms not very unlike some of the existing Chaetopods. These additional features are the following—(1) All existing Arthropoda have an ostiate heart and have undergone "phleboedesis," that is to say, the peripheral portions of the blood-vascular system are not fine tubes as they are in the Chaetopoda and as they were in the hypothetical ancestors of Arthropoda, but are swollen so as to obliterate to a large extent the coelom, whilst the separate veins entering the dorsal vessel or heart have coalesced, leaving valvate ostia (see fig. 1) by which the blood passes from a pericardial blood-sinus formed by the fused veins into the dorsal vessel or heart (see Lankester's *Zoology*, part ii., introductory chapter, 1900). The only exception to this is in the case of minute degenerate forms where the heart has disappeared altogether. The rigidity of the integument caused by the deposition of

dense chitin upon it is intimately connected with the physiological activity and form of all the internal organs, and is undoubtedly correlated with the total disappearance of the circular muscular layer of the body-wall present in Chaetopods. (2) In all existing Arthropoda the region in front of the mouth is no longer formed by the primitive prostomium or head-lobe, but one or more segments, originally post-oral, with their appendages have passed in front of the mouth (prosthomeres). At the same time the prostomium and its appendages cease to be recognizable as distinct elements of the head. The brain no longer consists solely of the nerve-ganglion-mass proper to the prostomial lobe, as in Chaetopoda, but is a composite (syncerebrum) produced by the fusion of this and the nerve-ganglion-masses proper to the prosthomeres or segments which pass forwards, whilst their parapodia (= appendages) become converted into eye-stalks, and antennae, or more rarely grasping organs. (3) As in Chaetopoda, coelomic funnels (coelomoducts) *may* occur right and left as pairs in each ring-like segment or somite of the body, and some of these are in all cases retained as gonoducts and often as renal excretory organs (green glands, coxal glands of Arachnida, *not* crural glands, which are epidermal in origin); but true nephridia, genetically identical with the nephridia of earthworms, do not occur (on the subject of coelom, coelomoducts and nephridia, see the introductory chapter of part ii. of Lankester's *Treatise on Zoology*).



After Lankester, *Q. J. Mic. Sci.* vol. xxxiv., 1893.

FIG. 1.—Diagram to show the gradual formation of the Arthropod pericardial blood-sinus and "ostiate" heart by the swelling up (phleboedesis) of the veins entering the dorsal vessel or heart of a Chaetopod-like ancestor. The figure on the left represents the condition in a Chaetopod, that on the right the condition in an Arthropod, the other two are hypothetical intermediate forms.

Tabular Statement of the Grades, Classes and Sub-classes of the Arthropoda.—It will be convenient now to give in the clearest form a statement of the larger subdivisions of the Arthropoda which it seems necessary to recognize at the present

day. The justification of the arrangement adopted will form the substance of the rest of the present article. The orders included in the various classes are not discussed here, but are treated of under the following titles:—PERIPATUS (Onychophora), CENTIPEDE and MILLIPEDE (Myriapoda), HEXAPODA (Insecta), ARACHNIDA and CRUSTACEA.

SUB-PHYLUM ARTHROPODA (of the Phylum Appendiculata).

Grade A. **Hyparthropoda** (hypothetical forms connecting ancestors of Chaetopoda with those of Arthropoda).

Grade B. **Protarthropoda**.

Class ONYCHOPHORA.

EX.—*Peripatus.*

Grade C. **Euarthropoda**.

Class 1. DIPLOPODA.

EX.—*Julus.*

Class 2. ARACHNIDA.

Grade *a.* Anomomeristica.

EX.—*Phacops.*

Grade *b.* Nomomeristica.

(*a*) Pantopoda.

EX.—*Pycnogonum.*

(*b*) Euarachnida.

EX.—*Limulus, Scorpio, Mygale, Acarus.*

Class 3. CRUSTACEA.

Grade *a.* Entomostraca.

EX.—*Apus, Branchipus, Cyclops, Balanus.*

Grade *b.* Malacostraca.

EX.—*Nebalia, Astacus, Oniscus, Gammarus.*

Class 4. CHILOPODA.

EX.—*Scolopendra.*

Class 5. HEXAPODA (syn. Insecta Pterygota).

EX.—*Locusta, Phryganea, Papilio, Apis, Mnsca, Cimex, Lucanus, Machilis.*

Incertae sedis—Tardigrada, Pentastomidae (degenerate forms).

The Segmentation of the Body of Arthropoda.—The body of the Arthropoda is more or less clearly divided into a series of rings, segments, or somites which can be shown to be repetitions one of another, possessing identical parts and organs which may be larger or smaller, modified in shape or altogether suppressed in one somite as compared with another. A similar constitution of the body is more clearly seen in the Chaetopod worms. In the Vertebrata also a repetition of units of structure (myotomes, vertebrae, &c.)—which is essentially of the same nature as the repetition in Arthropods and Chaetopods, but in many respects subject to peculiar developments—is observed. The name "metamerism" has been given to this structural phenomenon because the "meres," or repeated units, follow one another in line. Each such "mere" is often called a "metamere." A satisfactory consideration of the structure of the Arthropods demands a knowledge of what may be called the laws of metamerism, and reference should be made to the article under that head.

The Theory of the Arthropod Head.—The Arthropod head is a tagma or group of somites which differ in number and in their relative position in regard to the mouth, in different classes. In a simple Chaetopod (fig. 2) the head consists of the first somite only; that somite is perforated by the mouth, and is provided with a prostomium or prae-oral lobe. The prostomium is essentially a part or outgrowth of the first somite, and cannot be regarded as itself a somite. It gives rise to a nerve-ganglion mass, the prostomial ganglion. In the marine Chaetopods (the Polychaeta) (fig. 3), we find the same essential structure, but the prostomium may give rise to two or more tactile tentacles, and to the vesicular eyes. The somites have well-marked parapodia, and the second and third, as well as the first, may give rise to tentacles which are directed forward, and thus contribute to form "the head." But the mouth remains as an inpushing of the wall of the first somite.

From Goodrich, *Q. J. Micr. Sci.* vol. xi p. 247.

FIG. 2.—Diagram of the head and adjacent region of an Ohgochaet Chaetopod.

Pr, The prostomium.
m, The mouth.
A, The prostomial ganglion-mass or archi-cerebrum.
I, II, III, coelom of the first, second and

The Arthropoda are all distinguished from the Chaetopoda by the fact that the head consists of one or

more somites which lie *in front of the mouth* (now called prosthomeres), as well as of one or more somites behind it (opisthomeres). The first of the post-oral somites invariably has its parapodia modified so as to form a pair of hemignaths (mandibles). About 1870 the question arose for discussion whether the somites in front of the mouth are to be considered as derived from the prostomium of a Chaetopod-like ancestor. Milne-Edwards and Huxley had satisfied themselves with discussing and establishing, according to the data at their command, the number of somites in the Arthropod head, but had not considered the question of the *nature* of the prae-oral somites. Lankester (**2**) was the first to suggest that (as is actually the fact in the Nauplius larva of the Crustacea) the prae-oral somites or prosthomeres and their appendages were ancestrally post-oral, but have become prae-oral "by adaptational shifting of the oral aperture." This has proved to be a sound hypothesis and is now accepted as the basis upon which the Arthropod head must be interpreted (see Korschelt and Heider (**3**)). Further, the morphologists of the 'fifties appear, with few exceptions, to have accepted a preliminary scheme with regard to the Arthropod head and Arthropod segmentation generally, which was misleading and caused them to adopt forced conclusions and interpretations. It was conceived by Huxley, among others, that the same number of cephalic somites would be found to be characteristic of all the diverse classes of Arthropoda, and that the somites, not only of the head but of the various regions of the body, could be closely compared in their numerical sequence in classes so distinct as the Hexapods, Crustaceans and Arachnids.

third somites.

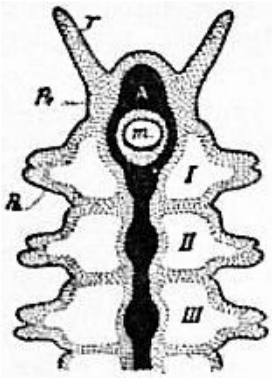


FIG. 3—Diagram of the head and adjacent region of a Polychaet Chaetopod Letters as in fig. 1, with the addition of T, prostomial tentacle; *Pa*, parapodium. (From Goodrich.)

The view which it now appears necessary to take is, on the contrary, this—viz that all the Arthropoda are to be traced to a common ancestor resembling a Chaetopod worm, but differing from it in having lost its chaetae and in having a prosthomere in front of the mouth (instead of prostomium only) and a pair of hemignaths (mandibles) on the parapodia of the buccal somite. From this ancestor

Arthropods with heads of varying degrees of complexity have been developed characteristic of the different classes, whilst the parapodia and somites of the body have become variously modified and grouped in these different classes. The resemblances which the members of one class often present to the members of another class in regard to the form of the limb-branches (rami) of the parapodia and the formation of tagmata (regions) are not hastily to be ascribed to common inheritance, but we must consider whether they are not due to homoplasy—that is, to the moulding of natural selection acting in the different classes upon fairly similar elements under like exigencies.

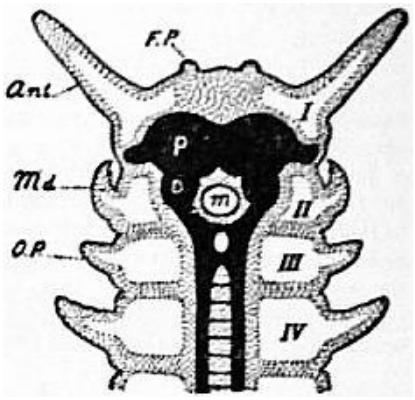


FIG. 4.—Diagram of the head and adjacent region of *Peripatus*. Monoprosthomerous.

m, Mouth.
I, Coelom of the first somite which carries the antennae and is in front of the mouth.
II, Coelom of the second somite which carries the mandibles (hence deuterognathous).
III and IV, Coelom of the third and fourth somites.
FP, Rudimentary frontal processes perhaps representing the prostomial tentacles of Polychaeta.
Ant, Antenna or tactile tentacle.
Md, Mandible.
Op, Oral-papilla.

The structure of the head in Arthropods presents *three* profoundly separated grades of structure dependent upon the number of prosthomeres which have been assimilated by the prae-oral region. The classes presenting these distinct plans of head-structure cannot be closely associated in any scheme of classification professing to be natural. Penpatus, the type-genus of the class Onychophora, stands at the base of the series with only a single prosthomere (fig. 4). In Peripatus the prostomium of the Chaetopod-like ancestor is atrophied, but it is possible that two processes on the front of the head (FP) represent in the embryo the dwindled prostomial tentacles. The single prosthomere carries the retractile tentacles as its "parapodia." The second somite is the buccal somite (II, fig. 4); its parapodia have horny jaws on their ends, like the claws on the following legs (fig. 9), and act as hemignaths (mandibles). The study of sections of the embryo establishes these facts beyond doubt. It also shows us that the neuromeres, no less than the embryonic coelomic cavities, point

P, Protocerebrum or foremost cerebral mass belonging to the first somite.
D, Deuterocerebrum, consisting of ganglion cells belonging to the second or mandibular somite. (After Goodrich.)

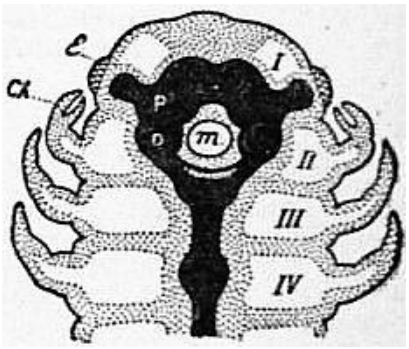


FIG. 5.—Diagram of the head and adjacent region of an Arachnid. Diprosthomerous in the adult condition, though embryologically the appendages of somite II and the somite itself are, as here drawn, not actually in front of the mouth.

E, Lateral eye.
Ch Chelicera.
m, Mouth.
P, Protocerebrum,
D, Deuterocerebrum.
I, II III, IV. Coelom of the first, second, third and fourth somites. (After Goodrich.)

to the existence of one, and only one, prosthomerp in Peripatus, of which the "protocerebrum," P, is the neuromere, whilst the deuterocerebrum, D, is the neuromere of the second or buccal somite. A brief indication of these facts is given by saying that the Onychophora are "deuterognathous"—that is to say, that the buccal somite carrying the mandibular hemignaths is the second of the whole series.

What has become of the nerve-ganglion of the prostomial lobe of the Chaetopod in Peripatus is not clearly ascertained, nor is its fate indicated by the study of the embryonic head of other Arthropods so far. Probably it is fused with the protocerebrum, and may also be concerned in the history of the very peculiar paired eyes of Peripatus, which are like those of Chaetopods in structure—viz vesicles with an intravesicular lens, whereas the eyes of all other Arthropods have essentially another structure, being "cups" of the epidermis, in which a knob-like or rod-like thickening of the cuticle is fitted as refractive medium.

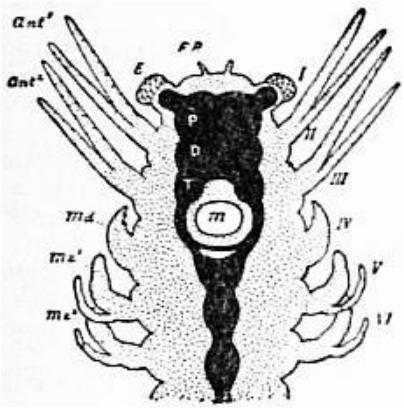
In Diplopoda (*Julus*, &c.) the results of embryological study point to a composition of the front part of the head exactly similar to that which we find in Onychophora. They are deuterognathous.

The Arachnida present the first stage of progress. Here embryology shows that there are two prosthomeres (fig. 5), and that the gnathobases of the chelae which act as the first pair of hemignaths are carried by the third somite. The Arachnida are therefore tritognathous. The two prosthomeres are indicated by their coelomic

cavities in the embryo (I and II, fig. 5), and by two neuromeres, the protocerebrum and the deuterocerebrum. The appendages of the first prosthomere are not present as tentacles, as in Peripatus and Diplopods, but are possibly represented by the eyes or possibly altogether aborted. The appendages of the second prosthomere are the well-known chelicerae of the Arachnids, rarely, if ever, antenniform, but modified as “retroverts” or clasp-knife tangs in spiders.

The Crustacea (fig. 6) and the Hexapoda (fig. 7) agree in having three somites in front of the mouth, and it is probable, though not ascertained, that the Chilopoda (Scolopendra, &c.) are in the same case. The three prosthomeres or prae-oral somites of Crustacea due to the sinking back of the mouth one somite farther than in Arachnida are not clearly indicated by coelomic cavities in the embryo, but their existence is clearly established by the development and position of the appendages and by the neuromeres.

The eyes in some Crustacea are mounted on articulated stalks, and from the fact that they can after injury be replaced by antenna-like appendages it is inferred that they represent the parapodia of the most anterior prosthomere. The second prosthomere carries the first pair of antennae and the third the second pair of antennae. Sometimes the pair of appendages has not a merely tactile jointed ramus, but is converted into a claw or clasper. Three neuromeres—a proto-, deutero-, and trito-cerebrum—corresponding to those three prosthomeres are sharply marked in the embryo. The fourth somite is that in which the mouth now opens, and which accordingly has its appendages converted into hemignathous mandibles. The Crustacea are tetartognathous.



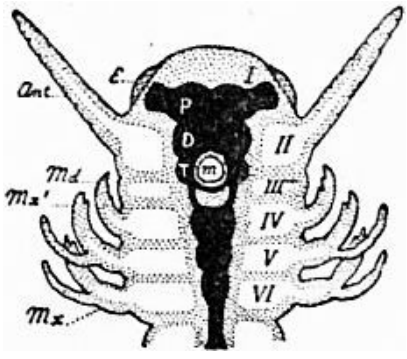


FIG. 6.—Diagram of the head of a Crustacean. Tri-prosthomerous.

FP, Frontal processes (observed in Cirrhiped nauplius-larvae) probably representing the prostomial tentacles of Chaetopods.
e, Eye.
*Ant*1, First pair of antennae.
*Ant*2, Second pair of antennae.
md, Mandible.
*mx*1, *mx*2, First and second pairs of maxillae.
m, Mouth.
I, II, and III, The three prosthomeres.
IV, V, VI, The three somites following the mouth.
P, Protocerebrum.
D, Deuterocerebrum.
T, Tritocerebrum.
(After Goodrich.)

FIG. 7.—Diagram of the head of a Hexapod insect.

e, Eye.
ant, Antenna.
md, Mandible.
*mx*1, First maxilla.
*mx*2, Second maxilla.
m, Mouth.
I, Region of the first or eye-bearing prosthomere.
II, Coelom of the second antenna-bearing prosthomere.
III, Coelom of the third prosthomere devoid of appendages.
IV, V, and VI, Coelom of the fourth, fifth and sixth somites.
P, Protocerebrum belonging to the first prosthomere.
D, Deuterocerebrum belonging to the second prosthomere.
T, Tritocerebrum belonging to the third prosthomere.
(After Goodrich.)

The history of the development of the head has been carefully worked out in the Hexapod insects. As in Crustacea and Arachnida, a first prosthomere is indicated by the paired eyes and the protocerebrum; the second prosthomere has a well-marked coelomic cavity, carries the antennae, and has the deuterocerebrum for its neuromere. The third prosthomere is represented by a well-marked pair of coelomic cavities and the tritocerebrum (III, fig. 7), but has no appendages. They appear to have aborted. The existence of this third prosthomere corresponding to the third prosthomere of the Crustacea is a strong argument for the derivation of the Hexapoda, and with them the Chilopoda, from some offshoot of the Crustacean stem or class. The buccal somite, with its mandibles, is in Hexapoda, as in Crustacea, the fourth: they are tetartognathous.

The adhesion of a greater or less number of somites to the buccal somite posteriorly (opisthomeres) is a matter of importance, but of minor importance, in the theory and history of the Arthropod head. In Peripatus no such adhesion or fusion occurs. In Diplopoda two opisthomeres—that is to say, one in addition to

the buccal somite—are united by a fusion of their terga with the terga of the prosthomeres. Their appendages are respectively the mandibles and the gnathochilarium.

In Arachnida the highest forms exhibit a fusion of the tergites of five post-oral somites to form one continuous carapace united with the terga of the two prosthomeres. The five pairs of appendages of the post-oral somites of the head or prosoma thus constituted all primitively carry gnathobasic projections on their coxal joints, which act as hemignaths: in the more specialized forms the mandibular gnathobases cease to develop.

In Crustacea the fourth or mandibular somite never has less than the two following somites associated with it by the adaptation of their appendages as jaws, and the ankylosis of their terga with that of the prosthomeres. But in higher Crustacea the cephalic "tagma" is extended, and more somites are added to the fusion, and their appendages adapted as jaws of a kind.

The Hexapoda are not known to us in their earlier or more primitive manifestations; we only know them as possessed of a definite number of somites arranged in definite numbers in three great tagmata. The head shows two jaw-bearing somites besides the mandibular somite (V, VI, in fig. 7)—thus six in all (as in some Crustacea), including prosthomeres, all ankylosed by their terga to form a cephalic shield. There is, however, good embryological evidence in some Hexapods of the existence of a seventh somite, the supra-lingual, occurring between the somite of the mandibles and the somite of the first maxillae (**4**). This segment is indicated embryologically by its paired coelomic cavities. It is practically an excalated somite, having no existence in the adult. It is probably not a mere coincidence that the Hexapod, with its two rudimentary somites devoid of appendages, is thus found to possess twenty-one somites, including that which carries the anus, and that this is also the number present in the Malacostracous Crustacea.

The Segmented Lateral Appendages or Limbs of Arthropoda.—It has taken some time to obtain any general acceptance of the view that the parapodia of the Chaetopoda and the limbs of Arthropoda are genetically identical structures; yet if we compare the parapodium of Tomopteris or of Phyllodoce with one of the foliaceous limbs of Branchipus or Apus, the correspondences of the two are

striking. An erroneous view of the fundamental morphology of the Crustacean limb, and consequently of that of other Arthropoda, came into favour owing to the acceptance of the highly modified limbs of Astacus as typical. Protopodite, endopodite, exopodite, and epipodite were considered to be the morphological units of the crustacean limb. Lankester (**5**) has shown (and his views have been accepted by Professors Korschelt and Heider in their treatise on *Embryology*) that the limb of the lowest Crustacea, such as Apus, consists of a corm or axis which may be jointed, and gives rise to outgrowths, either leaf-like or filiform, on its inner and outer margins (endites and exites). Such a corm (see figs. 10 and 11), with its outgrowths, may be compared to the simple parapodia of Chaetopoda with cirrhi and branchial lobe (fig. 8). It is by the specialization of two "endites" that the endopodite and exopodite of higher Crustacea are formed, whilst a flabelliform exite is the homogen or genetic equivalent of the epipodite (see Lankester, "Observations and Reflections on Apus Cancriformis," *Q. J. Micr. Sci.*). The reduction of the outgrowth-bearing "corm" of the parapodium of either a Chaetopod or an Arthropod to a simple cylindrical stump, devoid of outgrowths, is brought about when mechanical conditions favour such a shape. We see it in certain Chaetopods (*e.g.* Hesione) and in the Arthropod Peripatus (fig. 9). The conversion of the Arthropod's limb into a jaw, as a rule, is effected by the development of an endite near its base into a hard, chitinized, and often toothed gnathobase (see figs. 10 and 11, *en*1). It is not true

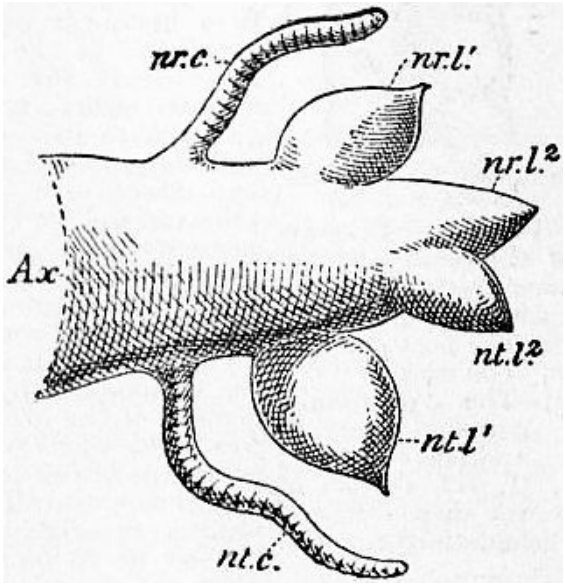


FIG. 8.—Diagram of the somite-appendage or parapodium of a Polychaet Chaetopod. The chaetae are omitted.

Ax, The axis.
nr.c, Neuropodial cirrhus.
*nr.l*1, *nr.l*2, Neuropodial lobes or endites.
nt.c. Notopodial cirrhus.
*nt.l*1, *nt.l*2, Notopodial lobes or exites.
The parapodium is represented with its neural or ventral surface uppermost.
(Original).

that all the biting processes of the Arthropod limb are thus produced—for instance, the jaws of Peripatus are formed by the axis or corm itself, whilst the poison-jaws of Chilopods, as also their maxillae, appear to be formed rather by the apex or terminal region of the ramus of the limb; but the opposing jaws (= hemignaths) of Crustacea, Arachnida and Hexapoda are gnathobases, and not the axis or corm. The endopodite (corresponding to the fifth endite of the limb of Apus, see fig. 10) becomes in Crustacea the "walking leg" of the mid-region of the body; it becomes the palp or jointed process of anterior segments. A second ramus, the "exopodite," often is also retained in the form of a palp or feeler. In Apus, as the figure shows, there are four of these "antenna-like" palps or filaments on the first thoracic limb. A common modification of the chief ramus of the Arthropod parapodium is the chela or nipper formed by the elongation of the penultimate joint of the ramus, so that the last joint works on it—as, for instance, in the lobster's claw. Such chelate rami or limb-branches are independently developed in Crustacea and in Arachnida, and are carried by somites of the body which do not correspond in position in the two groups. The range of modification of which the rami or limb-branches of the limbs of Arthropoda are capable is very large, and in allied orders or even families or genera we often find what is certainly the palp of the same appendage (as determined by numerical position of the segments)—in one case antenniform, in another chelate, in another pediform, and in another reduced to a mere stump or absent altogether. Very probably the power which the appendage of a given segment has of assuming the perfected form and proportions previously attained by the appendage of another segment must be classed as an instance of "homoeosis," not only where such a change is obviously due to abnormal development or injury, but also where it constitutes a difference permanently established between allied orders or smaller groups, or between the two sexes.

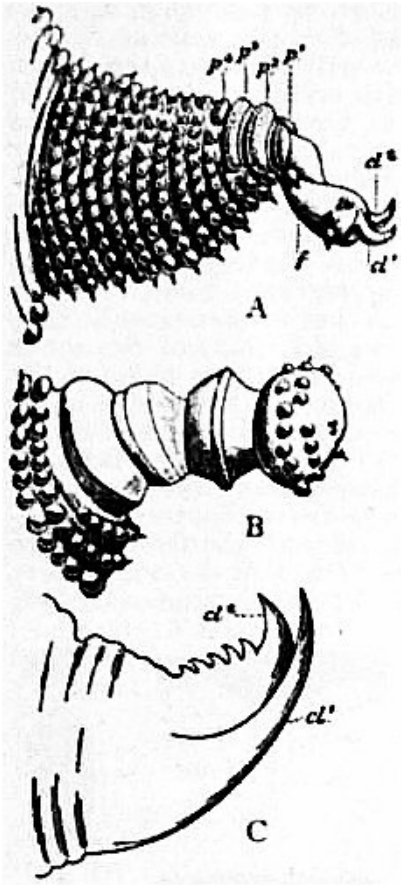


FIG. 9.—Three somite-appendages or parapodia of *Peripatus.*

A, A walking leg; *p*1 to *p*4, the characteristic "pads"; *f*, the foot; *cl*1, *cl*2, the two claws.
B, An oral papilla, one of the second pair of post-oral appendages.
C, One of the first post-oral pair of appendages or mandibles; *cl*1, *cl*2, the greatly enlarged claws. (Compare A.)
The appendages are represented with the neural or ventral surface uppermost.

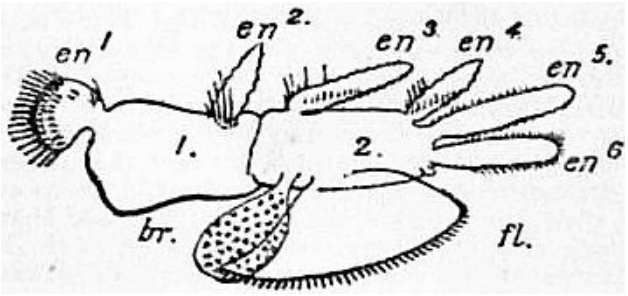
The most extreme disguise assumed by the Arthropod parapodium or appendage is that of becoming a mere stalk supporting an eye—a fact which did not obtain general credence until the experiments of Herbst in 1895, who found, on cutting off the eye-stalk of Palaemon, that a jointed antenna-like appendage was regenerated in its place. Since the eye-stalks of Podophthalmate Crustacea represent appendages, we are forced to the conclusion that the sessile eyes of other Crustacea, and of other Arthropoda generally, indicate the position of appendages which have atrophied.2

From what has been said, it is apparent that we cannot, in attempting to discover the affinities and divergences of the various forms of Arthropoda, attach a very high phylogenetic value to the coincidence or divergence in form of the appendages belonging to the somites compared with one another.

The principal forms assumed by the Arthropod parapodium and its rami may be thus enumerated:—

(1) Axial corm well developed, unsegmented or with two to four segments; lateral endites and exites (rami) numerous and of various lengths (certain limbs of lower Crustacea).

(2) Corm, with short unsegmented rami, forming a flattened foliaceous appendage, adapted to swimming and respiration (trunk-limbs of Phyllopods).



After Lankester, *Q. J. Mic. Sci.* vol. xxi., 1881.

FIG. 10.—The second thoracic (fifth post-oral) appendage of the left side of *Apus cancriformis*, placed with its ventral or neural surface uppermost to compare with figs. 8 and 9.

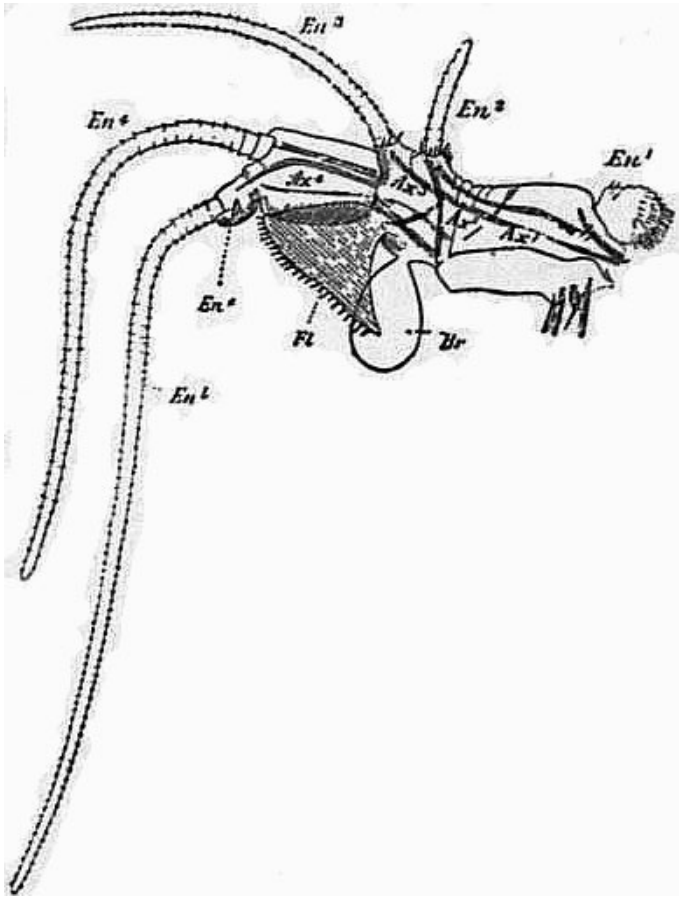
1, 2, The two segments of the axis.
*en*1, The gnathobase.
*en*2 to *en*6, The five following "endites."
fl, The flabellum or anterior exite.
br, The bract or posterior exite.

(3) Corm alone developed; with no endites or exites, but provided with terminal chitinous claws (ordinary leg of Peripatus), with terminal jaw teeth (jaw of Peripatus), or with blunt extremity (oral papilla of same) (see fig. 9).

(4) Three of the rami of the primitive limb (endites 5 and 6, and exite 1) specially developed as endopodite, exopodite, and epipodite—the first two often as firm and strongly chitinized, segmented, leg-like structures; the original axis or corm reduced to a basal piece, with or without a distinct gnathobase (endite 1)—typical tri-ramose limb of higher Crustacea.

(5) One ramus (the endopodite) alone developed—the original axis or corm serving as its basal joint with or without gnathobase. This is the usual uni-ramose limb found in the various classes of Arthropoda. It varies as to the presence or

absence of the jaw-process and as to the stoutness of the segments of the ramus, their number (frequently six, plus the basal corm), and the modification of the free end. This may be filiform or brush-like or lamellate when it is an antenna or palp; a simple spike (walking leg of Crustacea, of other aquatic forms, and of Chilopods and Diplopods); the terminal joint flattened (swimming leg of Crustacea and Gigantostraca); the terminal joint provided with two or with three recurved claws (walking leg of many terrestrial forms—*e.g.* Hexapoda and Arachnida); the penultimate joint with a process equal in length to the last joint, so as to form a nipping organ (chelae of Crustaceans and Arachnids); the last joint reflected and movable on the penultimate, as the blade of a clasp-knife on its handle (the retrovert, toothed so as to act as a biting jaw in the Hexapod *Mantis*, the Crustacean *Squilla* and others); with the last joint produced into a needle-like stabbing process in spiders.



After Lankester, *Q. J. Mic. Sci.* vol. xxi., 1881.

FIG. 11.—The first thoracic (fourth post-oral) appendage of *Apus cancriformis* (right side).

*Ax*1 to *Ax*4, the four segments of the axis with muscular bands.
*En*1, Gnathobase.
*En*2 to *En*5, The elongated jointed endites (rami).
*En*6, The rudimentary sixth endite (exopodite of higher Crustacea).
Fl, The flabellum which becomes the epipodite of higher forms.
Br, The bract devoid of muscles and respiratory in function.

(6) Two rami developed (usually, but perhaps not always, the equivalents of the endopodite and exopodite) supported on the somewhat elongated corm (basal segment). This is the typical "bi-ramose limb" often found in Crustacea. The rami may be flattened for swimming, when it is "a bi-ramose swimmeret," or both or only one may be filiform and finely annulate; this is the form often presented by the antennae of Crustacea, and rarely by prae-oral appendages in other Arthropods.

(7) The endopoditic ramus is greatly enlarged and flattened, without or with only one jointing, the corm (basal segment) is evanescent; often the plate-like endopodites of a pair of such appendages unite in the middle line with one another or by the intermediary of a sternal up-growth and form a single broad plate. These are the plate-like swimmerets and opercula of Gigantostraca and Limulus among Arachnids and of Isopod Crustaceans. They may have rudimentary exopodites, and may or may not have branchial filaments or lamellae developed on their posterior faces. The simplest form to which they may be reduced is seen in the genital operculum of the scorpion.

(8) The gnathobase becomes greatly enlarged and not separated by a joint from the corm; it acts as a hemignath or half jaw working against its fellow of the opposite side. The endopodite may be retained as a small segmented palp at the side of the gnathobase or disappear (mandible of Crustacea, Chilopoda and Hexapoda).

(9) The corm becomes the seat of a development of a special visual organ, the Arthropod eye (as opposed to the Chaetopod eye). Its jointing (segmentation) may be retained, but its rami disappear (Podophthalmous Crustacea). Usually it becomes atrophied, leaving the eye as a sessile organ upon the prae-oral region of

the body (the eye-stalk and sessile lateral eyes of Arthropoda generally, exclusive of Peripatus).

(10) The forms assumed by special modification of the elements of the parapodium in the maxillae, labium, &c., of Hexapods, Chilopods, Diplopods, and of various Crustacea, deserve special enumeration, but cannot be dealt with without ample space and illustration.

It may be pointed out that the most radical difference presented in this list is that between appendages consisting of the corm alone without rami (Onychophora) and those with more or less developed rami (the rest of the Arthropoda). In the latter class we should distinguish three phases: (*a*) those with numerous and comparatively undeveloped rami; (*b*) those with three, or two highly developed rami, or with only one—the corm being reduced to the dimensions of a mere basal segment; (*c*) those reduced to a secondary simplicity (degeneration) by overwhelming development of one segment (*e.g.* the isolated gnathobase often seen as "mandible" and the genital operculum).

There is no reason to suppose that any of the forms of limb observed in Arthropoda may not have been independently developed in two or more separate diverging lines of descent.

Branchiae.—In connexion with the discussion of the limbs of Arthropods, a few words should be devoted to the gill-processes. It seems probable that there are branchial plumes or filaments in some Arthropoda (some Crustacea) which can be identified with the distinct branchial organs of Chaetopoda, which lie dorsal of the parapodia and are not part of the parapodium. On the other hand, we cannot refuse to admit that any of the processes of an Arthropod parapodium may become modified as branchial organs, and that, as a rule, branchial out-growths are easily developed, *de novo*, in all the higher groups of animals. Therefore, it seems to be, with our present knowledge, a hopeless task to analyse the branchial organs of Arthropoda and to identify them genetically in groups.

A brief notice must suffice of the structure and history of the *Eyes*, the *Tracheae* and the so-called *Malpighian tubes* of Arthropoda, though special importance attaches to each in regard to the determination of the affinities of the various animals included in this great sub-phylum.

The Eyes.—The Arthropod eye appears to be an organ of special character developed in the common ancestor of the Euarthropoda, and distinct from the Chaetopod eye, which is found only in the Onychophora where the true Arthropod eye is absent. The essential difference between these two kinds of eye appears to be that the Chaetopod eye (in its higher developments) is a vesicle enclosing the lens, whereas the Arthropod eye is a pit or series of pits into which the heavy chitinous cuticle dips and enlarges knobwise as a lens. Two distinct forms of the Arthropod eye are observed—the monomeniscous (simple) and the polymeniscous (compound). The nerve-end-cells, which lie below the lens, are part of the general epidermis. They show in the monomeniscous eye (see article ARACHNIDA, fig. 26) a tendency to group themselves into "retinulae," consisting of five to twelve cells united by vertical deposits of chitin (rhabdoms). In the case of the polymeniscous eye (fig. 23, article ARACHNIDA) a single retinula or group of nerve-end-cells is grouped beneath each associated lens. A further complication occurs in each of these two classes of eye. The monomeniscous eye is rarely provided with a single layer of cells beneath its lens; when it is so, it is called monostichous (simple lateral eye of Scorpion, fig. 22, article ARACHNIDA). More usually, by an infolding of the layer of cells in development, we get three layers under the lens; the front layer is the corneagen layer, and is separated by a membrane from the other two which, more or less, fuse and contain the nerve-end-cells (retinal layer). These eyes are called diplostichous, and occur in Arachnida and Hexapoda (fig. 24, article ARACHNIDA).

On the other hand, the polymeniscous eye undergoes special elaboration on its lines. The retinulae become elongated as deep and very narrow pits (fig. 12 and explanation), and develop additional cells near the mouth of the narrow pit. Those nearest to the lens are the corneagen cells of this more elaborated eye, and those between the original retinula cells and the corneagen cells become firm and transparent. They are the crystalline cells or vitrella (see Watase, **7**). Each such complex of cells underlying the lenticle of a compound eye is called an "ommatidium"; the entire mass of cells underlying a monomeniscous eye is an "ommataeum." The ommataeum, as already stated, tends to segregate into retinulae which correspond potentially each to an ommatidium of the compound eye. The ommatidium is from the first segregate and consists of few cells. The compound eye of the king-crab (Limulus) is the only recognized instance of

ommatidia in their simplest state. Each can be readily compared with the single-layered lateral eye of the scorpion. In Crustacea and Hexapoda of all grades we find compound eyes with the more complicated ommatidia described above. We do not find them in any Arachnida.

It is difficult in the absence of more detailed knowledge as to the eyes of Chilopoda and Diplopoda to give full value to these facts in tracing the affinities of the various classes of Arthropods. But they seem to point to a community of origin of Hexapods and Crustacea in regard to the complicated ommatidia of the compound eye, and to a certain isolation of the Arachnida, which are, however, traceable, so far as the eyes are concerned, to a distant common origin with Crustacea and Hexapoda through the very simple compound eyes (monostichous, polymeniscous) of Limulus.

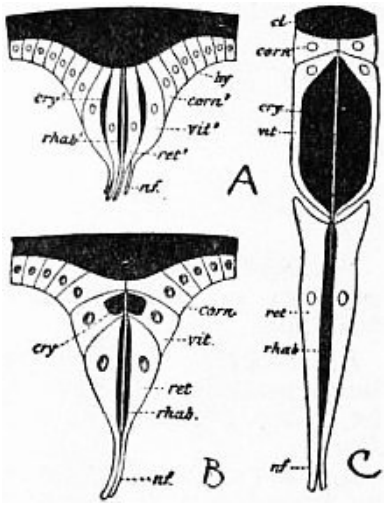


FIG. 12.—Diagram to show the derivation of the unit or "ommatidium" of the compound eye of Crustacea and Hexapoda, C, from a simple monomeniscous monostichous eye resembling the lateral eye of a scorpion, A, or the unit of the compound lateral eye of Limulus (see article ARACHNIDA, figs. 22 and 23). B represents an intermediate hypothetical form in which the cells beneath the lens are beginning to be superimposed as corneagen, vitrella and retinula, instead of standing side by side in horizontal series. The black represents the cuticular product of the epidermal cells of the ocular area, taking the form either of lens, *cl*, of crystalline body, *cry*, or of rhabdom, *rhab*; *hy*, hypodermis or epidermal cells; *corn*1, laterally-placed cells in the simpler stage, A, which like the nerve-end cells, *vit*1 and *ret*1, are corneagens or lens-producing; *corn*, specialized corneagen or lens-producing cells; *vit*1, potential vitrella cells with *cry*1, potential crystalline body now indistinguishable from retinula cells and rhabdomeres; *vit*, vitrella cell with *cry*, its contained cuticular product, the crystalline cone or body; *ret1*, *rhab*1, retinula cells and rhabdom of scorpion undifferentiated from adjacent cells, *vit*1; *ret*, retinula cell; *rhab*, rhabdom; *nf*, optic nerve-fibres. (Modified from Watase.)

The Tracheae.—In regard to tracheae the very natural tendency of zoologists has been until lately to consider them as having once developed and once only,

and therefore to hold that a group "Tracheata" should be recognized, including all tracheate Arthropods. We are driven by the conclusions arrived at as to the derivation of the Arachnida from branchiate ancestors, independently of the other tracheate Arthropods, to formulate the conclusion that tracheae have been independently developed in the Arachnidan class. We are also, by the isolation of Peripatus and the impossibility of tracing to it all other tracheate Arthropoda, or of regarding it as a degenerate offset from some one of the tracheate classes, forced to the conclusion that the tracheae of the Onychophora have been independently acquired. Having accepted these two conclusions, we formulate the generalization that tracheae can be independently acquired by various branches of Arthropod descent in adaptation to a terrestrial as opposed to an aquatic mode of life. A great point of interest therefore exists in the knowledge of the structure and embryology of tracheae in the different groups. It must be confessed that we have not such full knowledge on this head as could be wished for. Tracheae are essentially tubes like blood-vessels—apparently formed from the same tissue elements as blood-vessels—which contain air in place of blood, and usually communicate by definite orifices, the tracheal stigmata, with the atmosphere. They are lined internally by a cuticular deposit of chitin. In Peripatus and the Diplopods they consist of bunches of fine tubes which do not branch but diverge from one another; the chitinous lining is smooth. In the Hexapods and Chilopods, and the Arachnids (usually), they form tree-like branching structures, and their finest branches are finer than any blood-capillary, actually in some cases penetrating a single cell and supplying it with gaseous oxygen. In these forms the chitinous lining of the tubes is thickened by a close-set spiral ridge similar to the spiral thickening of the cellulose wall of the spiral vessels of plants. It is a noteworthy fact that other tubes in these same terrestrial Arthropoda—namely, the ducts of glands—are similarly strengthened by a chitinous cuticle, and that a spiral or annular thickening of the cuticle is developed in them also. Chitin is *not* exclusively an ectodermal product, but occurs also in cartilaginous skeletal plates of mesoblastic origin (connective tissue). The immediate cavities or pits into which the tracheal stigmata open appear to be in many cases ectodermic in sinkings, but there seems to be no reason (based on embryological observation) for regarding the tracheae as an ingrowth of the ectoderm. They appear, in fact, to be an air-holding modification of the vasifactive connective tissue. Tracheae are abundant just in proportion as blood-vessels become suppressed. They are reciprocally exclusive.

It seems not improbable that they are two modifications of the same tissue-elements. In Peripatus the stigmatic pits at which the tracheae communicate with the atmosphere are scattered and not definite in their position. In other cases the stigmata are definitely paired and placed in a few segments or in several. It seems that we have to suppose that the vasifactive tissue of Arthropoda can readily take the form of air-holding instead of blood-holding tubes, and that this somewhat startling change in its character has taken place independently in several instances —viz. in the Onychophora, in more than one group of Arachnida, in Diplopoda, and again in the Hexapoda and Chilopoda.

The Malpighian Tubes.—This name is applied to the numerous fine caecal tubes of noticeable length developed from the proctodaeal invert of ectodermal origin in Hexapods. These tubes are shown to excrete nitrogenous waste products similar to uric acid. Tubes of renal excretory function in a like position occur in most terrestrial Arthropoda—viz. in Chilopoda, Diplopoda and Arachnida. They are also found in some of the semi-terrestrial and purely aquatic Amphipod Crustaceans. But the conclusion that all such tubes are identical in essential character seems to be without foundation. The Malpighian tubes of Hexapods are outgrowths of the proctodaeum, but those of Scorpion and the Amphipod Crustacea are part of the metenteron or endodermal gut, though originating near its junction with the proctodaeum. Hence the presence or absence of such tubes cannot be used as an argument as to affinity without some discrimination. The Scorpion's so-called Malpighian tubes are *not* the same organs as those so named in the other Tracheata. Such renal caecal tubes seem to be readily evolved from either metenteron or proctodaeum when the conditions of the out-wash of nitrogenous waste-products are changed by the transference from aquatic to terrestrial life. The absence of such renal caeca in Limulus and their presence in the terrestrial Arachnida is precisely on a parallel with their absence in aquatic Crustacea and their presence in the feebly branchiate Amphipoda.

Group Characters.—We shall now pass the groups of the Arthropoda in review, attempting to characterize them in such a way as will indicate their probable affinities and genetic history.

SUB-PHYLUM ARTHROPODA.—The characters of the sub-phylum and those of the associated sub-phyla Chaetopoda and Rotifera have been given above, as

well as the general characters of the phylum Appendiculata which comprises these great sub-phyla.

Grade A.—**Hyparthropoda**.
Hypothetical forms.

Grade B.—**Protarthropoda**.

(*a*) The integument is covered by a delicate soft cuticle (not firm or plated) which allows the body and its appendages great range of extension and contraction.

(*b*) The paired claws on the ends of the parapodia and the fang-like modifications of these on the first post-oral appendages (mandibles) are the only hard chitinous portions of the integument.

(*c*) The head is deuterognathous—that is to say, there is only one prosthomere, and accordingly the first and only pair of hemignaths is developed by adaptation of the appendages of the second somite.

(*d*) The appendages of the third somite (second post-oral) are clawless oral papillae.

(*e*) The rest of the somites carry equi-formal simple appendages, consisting of a corm or axis tipped with two chitinous claws and devoid of rami.

(*f*) The segmentation of the body is anomomeristic, there being no fixed number of somites characterizing all the forms included.

(*g*) The pair of eyes situated on the prosthomere are not of the Euarthropod type, but resemble those of Chaetopods (hence Nereid-ophthalmous).

(*h*) The muscles of the body-wall and gut do not consist of transversely-striped muscular fibre, but of the unstriped tissue observed also in Chaetopoda.

(*i*) A pair of coelomoducts is developed in every somite including the prosthomere, in which alone it atrophies in later development.

(*j*) The ventral nerve-cords are widely separated—in fact, lateral in position.

(*k*) There are no masses of nerve-cells forming a ganglion (neuromere) in each somite. (In this respect the Protarthropoda are at a lower stage than most of the existing Chaetopoda.)

(*l*) The genital ducts are formed by the enlargement of the coelomoducts of the penultimate somite.

Class (Unica).—ONYCHOPHORA.

With the characters of the grade: add the presence within the body of fine unbranched tracheal tubes, devoid of spiral thickening, opening to the exterior by numerous irregularly scattered tracheal pits.

Genera—Eoperipatus, Peripatopsis, Opisthopatus, &c. (See PERIPATUS.)

Grade C (of the Arthropoda).—**Euarthropoda**.

(*a*) Integument heavily plated with firm chitinous cuticle, allowing no expansion and retraction of regions of the body nor change of dimensions, except, in some cases, a dorso-ventral bellows movement. The separation of the heavier plates of chitin by grooves of delicate cuticle results in the hinging or jointing of the body and its appendages, and the consequent flexing and extending of the jointed pieces.

(*b*) Claws and fangs are developed on the branches or rami of the parapodia, not on the end of the axis or corm.

(*c*) The head is either deuterognathous, tritognathous, or tetartognathous.

(*d*) Rarely only one, and usually at least two, of the somites following the mandibular somite carry appendages modified as jaws (with exceptions of a secondary origin).

(*e*) The rest of the somites may all carry appendages, or only a limited number may carry appendages. In all cases the appendages primarily develop rami or branches which form the limbs, the primitive axis or corm being reduced and of insignificant size. In the most primitive stock all the post-oral appendages had gnathobasic outgrowths.

(*f*) The segmentation of the body is anomomeristic in the more archaic members of each class, nomomeristic in the higher members.

(*g*) The two eyes of Chaetopod structure have disappeared, and are replaced by the Euarthropod eyes.

(*h*) The muscles in all parts of the body consist of striped muscular fibre, never of unstriped muscular tissue.

(*i*) The coelomoducts are suppressed in most somites, and retained only as the single pair of genital ducts (very rarely more numerous) and in some also as the excretory glands (one or two pairs).

(*j*) The ventral nerve-cords approach one another in the mid-ventral line behind the mouth.

(*k*) The nerve-cells of the ventral nerve cords are segregated as paired ganglia in each somite, often united by meristic dislocation into composite ganglia.

(*l*) The genital ducts may be the coelomoducts of the penultimate or ante-penultimate or adjacent somite, or of a somite placed near the middle of the series, or of a somite far forward in the series.

Class 1 (of the Euarthropoda).—DIPLOPODA.

The head has but one prosthomere (monoprosthomerous), and is accordingly deuterognathous. This carries short-jointed antennae (in one case bi-ramose) and eyes, the structure and development of which require further elucidation. Only one somite following the first post-oral or mandibular segment has its appendages modified as jaws.

The somites of the body, except in Pauropus, either fuse after early development and form double somites with two pairs of appendages (Julus, &c.), or present legless and leg-bearing somites alternating.

Somites, anomomeristic, from 12 to 150 in the post-cephalic series.

The genital ducts open in the fourth, or between the fourth and fifth post-oral somite.

Terrestrial forms with small-jointed legs formed by adaptation of a single ramus of the appendage. Tracheae are present.

Note.—The Diplopoda include the Juliformia, the Symphyla (Scolopendrella), and Pauropoda (Pauropus). They were until recently classified with the Chilopoda (Centipedes), with which they have no close affinity, but only a superficial resemblance. (Compare the definition of the class Chilopoda.)

The movement of the legs in Diplopoda is like that of those of Peripatus, of the Phyllopod Crustacea, and of the parapodia of Chaetopoda, symmetrical and identical on the two sides of the body. The legs of Chilopoda move in alternating groups on the two sides of the body. This implies a very much higher development of nerves and muscles in the latter. (See MILLIPEDE.)

Class 2 (of the Euarthropoda).—ARACHNIDA.

Head tritognathous and diprosthomerous—that is to say, with two prosthomeres, the first bearing typical eyes, the second a pair of appendages reduced to a single ramus, which is in more primitive forms antenniform, in higher forms chelate or retrovert. The ancestral stock was pantognathobasic—*i.e.* had a gnathobase or jaw process on every parapodium. As many as six pairs of appendages following the mouth may have an enlarged gnathobase actually functional as a jaw or hemignath, but a ramus is well developed on each of these appendages either as a simple walking leg, a palp or a chela. In the more primitive forms the appendage of every post-oral somite has a gnathobase and two rami; in higher specialized forms the gnathobases may be atrophied in every appendage, even in the first post-oral.

The more primitive forms are anomomeristic; the higher forms nomomeristic, showing typically three groups or tagmata of six somites each.

The genital apertures are placed on the first somite of the second tagma or mesosoma. Their position is unknown in the more primitive forms. The more primitive forms have branchial respiratory processes developed on a ramus of each of the post-oral appendages. In higher specialized forms these branchial processes become first of all limited to five segments of the mesosoma, then sunk beneath the surface as pulmonary organs, and finally atrophied, their place being taken by a well-developed tracheal system.

A character of great diagnostic value in the more primitive Arachnida is the tendency of the chitinous investment of the tergal surface of the telson to unite during growth with that of the free somites in front of it, so as to form a pygidial shield or posterior carapace, often comprising as many as fifteen somites (Trilobites, Limulus).

A pair of central monomeniscous diplostichous eyes is often present on the head. Lateral eyes also are often present which are monostichous with aggregated lenses (*Limulus*) or with isolated lenses (Scorpio), or are diplostichous with simple lens (*Pedipalpi*, Araneae, &c.).

Class 3 (of the Euarthropoda).—CRUSTACEA.

Head tetartognathous and triprosthomerous—that is to say, with three prosthomeres; the first bearing typical eyes, the second a pair of antenniform appendages (often bi-ramose), the third a pair of appendages usually antenniform, sometimes claw-like. The ancestral stock was (as in the Arachnida) pantognathobasic, that is to say, had a gnathobase or jaw-process on the base of every post-oral appendage.

Besides the first post-oral or mandibular pair, at least two succeeding pairs of appendages are modified as jaws. These have small and insignificant rami, or none at all, a feature in which the Arachnida differ from them. The appendages of four or more additional following somites may be turned upwards towards the mouth and assist in the taking of food.

The more primitive forms (Entomostraca) are anomomeristic, presenting great variety as to number of somites, form of appendages, and tagmatic grouping; the higher forms (Malacostraca) are nomomeristic, showing in front of the telson twenty somites, of which the six hinder carry swimmerets and the five next in front ambulatory limbs. The genital apertures are neither far forward nor far backward in the series of somites, *e.g.* on the fourteenth post-oral in Apus, on the ninth post-oral in female Astacus and in Cyclops.

With rare exceptions, branchial plates are developed either by modification of a ramus of the limbs or as processes on a ramus, or upon the sides of the body. No tracheate Crustacea are known, but some terrestrial Isopoda develop pulmonary in-sinkings of the integument. A characteristic, comparable in value to that

presented by the pygidial shield of Arachnida, is the frequent development of a pair of long appendages by the penultimate somite, which with the telson form a trifid, or, when that is small, a bifid termination to the body.

The lateral eyes of Crustacea are polymeniscous, with highly specialized retinulae like those of Hexapoda, and unlike the simpler compound lateral eyes of lower Arachnida. Monomeniscous eyes are rarely present, and when present, single, minute, and central in position.

Note.—The Crustacea exhibit a longer and more complete series of forms than any other class of Arthropoda, and may be regarded as preserving the most completely represented line of descent.

Class 4.—Chilopoda.

Head triprosthomerous[3] and tetartognathous. The two somites following the mandibular or first post-oral or buccal somite carry appendages modified as maxillae. The fourth post-oral somite has its appendages converted into very large and powerful hemignaths, which are provided with poison-glands. The remaining somites carry single-clawed walking legs, a single pair to each somite. The body is anomomeristic, showing in different genera from 17 (inclusive of the anal and genital) to 175 somites behind that which bears the poison jaws. No tagmata are developed. The genital ducts open on the penultimate somite.

Tracheae are developed which are dendriform and with spiral thickening of their lining. Their trunks open at paired stigmata placed laterally in each somite of the trunk or in alternate somites. Usually the tracheae open by paired stigmata placed upon the sides of a greater or less number of the somites, but never quite regularly on alternating somites. At most they are present on all the pedigerous somites excepting the first and the last. In *Scutigera* there are seven unpaired dorsal stigmata, each leading into a sac whence a number of air-holding tubes project into the pencardial blood-sinus.

Renal caecal tubes (Malpighian tubes) open into the proctodaeum. (See Centipede.)

Class 5.—Hexapoda.

Head shown by its early development to be triprosthomerous and consequently tetartognathous. The first prosthomere has its appendages represented by the compound eyes and a protocerebrum, the second has the antennae for its appendages and a deutocerebral neuromere, the third has suffered suppression of its appendages (which corresponded to the second pair of antennae of Crustacea), but has a tritocerebrum and coelomic chamber. The mandibular somite bears a pair of gnathobasic hemignaths without rami or palps, and is followed by two jaw-bearing somites (maxillary and labial). This enumeration would give six somites in all to the head—three prosthomeres and three opisthomeres. Recent investigations (Folsom, **4**) show the existence in the embryo of a prae-maxillary or supra-lingual somite which is suppressed during development. This gives seven somites to the Hexapod's head, the tergites of which are fused to form a cephalic carapace or box. The number is significant, since it agrees with that found in Edriophthalmous Crustacea, and assigns the labium of the Hexapod to the same somite numerically as that which carries the labium-like maxillipedes of those Crustacea.

The somites following the head are strictly nomomeristic and nomotagmic. The first three form the thorax, the appendages of which are the walking legs, tipped with paired claws or ungues (compare the homoplastic claws of Scorpio and Peripatus). Eleven somites follow these, forming the abdominal "tagma," giving thus twenty-one somites in all (as in the higher Crustacea). The somites of the abdomen all may carry rudimentary appendages in the embryo, and some of the hinder somites may retain their appendages in a modified form in adult life. Terminal telescoping of the abdominal somites and excalation may occur in the adult, reducing the obvious abdominal somites to as few as eight. The genital apertures are median and placed far back in the series of somites, viz. the female on the seventh abdominal (seventeenth of the whole series) and the male on the ninth or ante-penultimate abdominal (nineteenth of the whole series). The appendages of the eighth and tenth abdominal somites are modified as gonapophyses. The eleventh abdominal segment is the telson, usually small and soft; it carries the anus.

The Hexapoda are not only all confined to a very definite disposition of the somites, appendages and apertures, as thus indicated, but in other characters also they present the specialization of a narrowly-limited highly-developed order of

such a class as the Crustacea rather than a range from lower more generalized to higher more specialized forms such as that group and also the Arachnida present. It seems to be a legitimate conclusion that the most primitive Hexapoda were provided with wings, and that the term Pterygota might be used as a synonym of Hexapoda. Many Hexapoda have lost either one pair or both pairs of wings; cases are common of wingless genera allied to ordinary Pterygote genera. Sdme Hexapods which are very primitive in other respects happen to be also Apterous, but this cannot be held to prove that the possession of wings is not a primitive character of Hexapods (compare the case of the Struthious Birds). The wings of Hexapoda are lateral expansions of the terga of the second and third thoracic somites. They appear to be serial equivalents (homogenous meromes) of the tracheal gills, which develop in a like position on the abdominal segments of some aquatic Hexapods.

The Hexapoda are all provided with a highly developed tracheal system, which presents considerable variation in regard to its stigmata or orifices of communication with the exterior. In some a serial arrangement of stigmata comparable to that observed in Chilopoda is found. In other cases (some larvae) stigmata are absent; in other cases again a single stigma is developed, as in the smaller Arachnida and Chilopoda, in the median dorsal line or other unexpected position. When the facile tendency of Arthropoda to develop tracheal air-tubes is admitted, it becomes probable that the tracheae of Hexapods do not all belong to one original system, but may be accounted for by new developments within the group. Whether the primitive tracheal system of Hexapoda was a closed one or open by serial stigmata in every somite remains at present doubtful, but the intimate relation of the system to the wings and tracheal gills cannot be overlooked.

The lateral eyes of Hexapoda, like those of Crustacea, belong to the most specialized type of “compound eye,” found only in these two classes. Simple monomeniscous eyes are also present in many Hexapods.

Renal excretory caeca (Malpighian tubes) are developed from the proctodaeum (not from mesenteron as in scorpion and Amphipoda).

Concluding Remarks on the Relationships to one another of the Classes of the Arthropoda.—Our general conclusion from a survey of the Arthropoda amounts

to this, that whilst Peripatus, the Diplopoda, and the Arachnida represent terrestrial offshoots from successive lower grades of primitive aquatic Arthropoda which are extinct, the Crustacea alone present a fairly full series of representatives leading upwards from unspecialized forms. The latter were not very far removed from the aquatic ancestors (Trilobites) of the Arachnida, but differed essentially from them by the higher specialization of the head. We can gather no indication of the forefathers of the Hexapoda or of the Chilopoda less specialized than they are, whilst possessing the essential characteristics of these classes. Neither embryology nor palaeontology assists us in this direction. On the other hand, the facts that the Hexapoda and the Chilopoda have triprosthomerous heads, that the Hexapoda have the same total number of somites as the nomomeristic Crustacea, and the same number of opisthomeres in the head as the more terrestrial Crustacea, together with the same adaptation of the form of important appendages in corresponding somites, and that the compound eyes of both Crustacea and Hexapoda are extremely specialized and elaborate in structure and identical in that structure, all lead to the suggestion that the Hexapoda, and with them, at no distant point, the Chilopoda, have branched off from the Crustacean main stem as specialized terrestrial lines of descent. And it seems probable that in the case of the Hexapoda, at any rate, the point of departure was subsequent to the attainment of the nomomeristic character presented by the higher grade of Crustacea. It is on the whole desirable to recognize such affinities in our schemes of classification.

We may tabulate the facts as to head-structure in Chaetopoda and Arthropoda as follows:—

Grade *x* (below the Arthropoda).—AGNATHA, APROSTHOMERA.

Without parapodial jaws; without the addition of originally post-oral somites to the prae-oral region, which is a simple prostomial lobe of the first somite; the first somite is perforated by the mouth and its parapodia are not modified as jaws.

= CHARTOPODA.

Grade 1 (of the Arthropoda).—MONOGNATHA, MONOPROSTHOMERA.

With a single pair of parapodial jaws carried by the somite which is perforated by the mouth; this is not the first somite, but the second. The first somite has become a prosthomere, and carries a pair of extensile antennae.

= Onychophora (*Peripatus, &c.*).

Grade 2 (of the Arthropoda).—Dignatha, Monoprosthomera.

The third somite as well as the second develops a pair of parapodial jaws; the first somite is a prosthomere carrying jointed antennae.

= Diplopoda.

Grade 3 (of the Arthropoda).—Pantognatha, Diprosthomera.

A gnathobase is developed (in the primitive stock) on every pair of post-oral appendages; two prosthomeres present, the second somite as well as the first having passed in front of the mouth, but only the second has appendages.

= Arachnida.

Grade 4 (of the Arthropoda).—Pantognatha, Triprosthomera.

The original stock, like that of the last grade, has a gnathobase on every post-oral appendage, but three prosthomeres are now present, in consequence of the movement of the oral aperture from the third to the fourth somite. The later eyes are polymeniscous, with specialized vitrellae and retinulae of a definite type peculiar to this grade.

= Crustacea, Chilopoda, Hexapoda.

According to older views the increase of the number of somites in front of the mouth would have been regarded as a case of intercalation by new somite-budding of new prae-oral somites in the series. We are prohibited by a general consideration of metamerism in the Arthropoda from adopting the hypothesis of intercalation of somites. However strange it may seem, we have to suppose that one by one in the course of long historical evolution somites have passed forwards and the mouth has passed backwards. In fact, we have to suppose that the actual somite which in grades 1 and 2 bore the mandibles lost those mandibles, developed their rami as tactile organs, and came to occupy a position in front of the mouth, whilst its previous jaw-bearing function was taken up by the next somite in order, into which the oral aperture had passed. A similar history must have been slowly brought about when this second mandibulate somite in its turn became agnathous and passed in front of the mouth. The mandibular

parapodia may be supposed during the successive stages of this history to have had, from the first, well-developed rami (one or two) of a palp-like form, so that the change required when the mouth passed away from them would merely consist in the suppression of the gnathobase. The solid palpless mandible such as we now see in some Arthropoda is, necessarily, a late specialization. Moreover, it appears probable that the first somite never had its parapodia modified as jaws, but became a prosthomere with tactile appendages before parapodial jaws were developed at all, or rather *pari passu* with their development on the second somite. It is worth while bearing in mind a second possibility as to the history of the prosthomeres, viz. that the buccal gnathobasic parapodia (the mandibles) were in each of the three grades of prosthomerism only developed after the recession of the mouth and the addition of one, of two, or of three post-oral somites to the prae-oral region had taken place. In fact, we may imagine that the characteristic adaptation of one or more pairs of post-oral parapodia to the purposes of the mouth as jaws did not occur until after ancestral forms with one, with two, and with three prosthomeres had come into existence. On the whole the facts seem to be against this supposition, though we need not suppose that the gnathobase was very large or the rami undeveloped in the buccal parapodia which were destined to lose their mandibular features and pass in front of the mouth.

REFERENCES.—**1.** Bateson, *Materials for the Study of Variation* (Macmillan, 1894), p. 85; **2.** Lankester, "Primitive Cell-layers of the Embryo." *Annals and Mag. Nat. Hist.* (1873), p. 336; **3.** Korschelt and Heider, *Entwickelungsgeschichte* (Jena, 1892), cap. xv. p. 389; **4.** Folsom, "Development of the Mouth Parts of Anurida," *Bulletin Mus. Comp. Zool. Harvard College*, vol. xxxvi. No. 5 (1900), pp. 142-146; **5.** Lankester, "Observations and Reflections on the Appendages and Nervous System of Apus Cancriformis," *Quart. Journ. Micr. Sci.* vol. xxi. (1881); **6.** Hofer, "Ein Krebs mit einer Extremität statt eines Stielauges," *Verhandl. d. deutschen zool. Gesellsch.* (1894); **7.** Watase, "On the Morphology of the Compound Eyes of Arthropods," *Studies from the Biol. Lab. of the Johns Hopkins University*, vol. iv. pp. 287-334; **8.** Benham describes backward shifting of the oral aperture in certain Chaetopods, *Proc. Zoolog. Soc. London* (1900), No. lxiv. p. 976. N.B.—References to the early literature concerning the group Arthropoda will be found in Carus, *Geschichte der Zoologie*. The more important literature up to 1892 is given in the admirable treatise on Embryology by Professors Korschelt

and Heider. Detailed references will be found under the articles on the separate groups of Arthropoda. (E. R. L.)

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1 The group Arthropoda itself, thus constituted, was precisely identical in its area with the Insecta of Linnaeus, the Entoma of Aristotle. But the word "Insect" had become limited since the days of Linnaeus to the Hexapod Pterygote forms, to the exclusion of his Aptera. Lamarck's penetrating genius is chiefly responsible for the shrinkage of the word Insecta, since it was he who, forty years after Linnaeus's death, set up and named the two great classes Crustacea and Arachnida (included by Linnaeus under Insecta as the order "Aptera"), assigning to them equal rank with the remaining Insecta of Linnaeus, for which he proposed the very appropriate class-name "Hexapoda." Lamarck, however, appears not to have insisted on this name Hexapoda, and so the class of Pterygote Hexapods came to retain the group-name Insecta, which is, historically or etymologically, no more appropriate to them than it is to the classes Crustacea and Arachnida. The tendency to retain the original name of an old and comprehensive group for one of the fragments into which such group becomes divided by the advance of knowledge—instead of keeping the name for its logical use as a comprehensive term, including the new divisions, each duly provided with a new name—is most curiously illustrated in the history of the word physiology. Cicero says, "Physiologia naturae ratio," and such was the meaning of the name *Physiologus*, given to a cyclopaedia of what was known and imagined about earth, sea, sky, birds, beasts and fishes, which for a thousand years was the authoritative source of information on these matters, and was translated into every European tongue. With the revival of learning, however, first one and then another special study became recognized—anatomy, botany, zoology, mineralogy, until at last the great comprehensive term physiology was bereft of all its once-included subject-matter, excepting the study of vital processes pursued by the more learned members of the medical profession. Professional tradition and an astute perception on their part of the omniscience suggested by the terms, have left the medical men in English-speaking lands in undisturbed but illogical possession of the words physiology, physic and physician.

2 H. Milne-Edwards, who was followed by Huxley, long ago formulated the conclusion that the eye-stalks of Crustacea are modified appendages, basing his argument on a specimen of Palinurus (figured in Bateson's book (**1**), in which the eye-stalk of one side is replaced by an antenniform palp. Hofer (**6**) in 1894 described a similar case in Astacus.

3 Embryological evidence of this is still wanting. In the other classes of Arthropoda we have more or less complete embryological evidence on the subject. It appears from observation of the embryo that whilst the first prosthomere of Centipedes has its appendages reduced and represented only by eye-patches (as in Arachnida, Crustacea and Hexapoda). the second has a rudimentary antenna, which disappears, whilst the third carries the permanent antennae, which accordingly correspond to the second antennae of Crustacea, and are absent in Hexapoda.

ARTHUR (Fr. *Artus*), the central hero of the cycle of romance known as the *Matière de Bretagne* (see ARTHURIAN LEGEND). Whether there was an historic Arthur has been much debated; undoubtedly for many centuries after the appearance of Geoffrey of Monmouth's *Historia Britonum* (circ. 1136), the statements therein recorded of a mighty monarch, who ruled over Britain in the 5th-6th centuries, and carried his conquests far afield, even to the gates of Rome, obtained general, though not universal, credence. Even in the 12th century there were some who detected, and derided, the fictitious character of Geoffrey's "History." As was naturally to be expected, the pendulum swung to the other extreme, and in a more critical age the existence of Arthur was roundly denied. The truth probably lies midway between the two. The words of Wace, the Norman poet who translated the *Historia* into verse, are here admirably to the point. Speaking of the tales told of Arthur, he says:—

"Ne tot mençunge, ne tot veir,
Ne tot fable, ne tot saveir,
Tant ont li contéor conté,
Et li fabléor tant fablé
Por lor contes embeleter
Que tout ont fait fable sembler."[1]

The opinion now generally accepted by scholars is that the evidence of Nennius, whose *Historia Britonum* preceded that of Geoffrey by some 400 years, is in the main to be relied on. He tells us that Arthur was *Dux bellorum*, and led the armies of the British kings against the Saxon invaders, whom he defeated in twelve great battles. *Tunc Arthur pugnabat cum regibus Britonum, sed ipse dux erat bettorum.*

The traditional site of these battles covers a very wide area, and it is supposed that Arthur held a post analogous to that of the general who, under the Roman occupation, was known as *Comes Britanniae*, and held a roving commission to defend the island wherever attacked, in contradistinction to the *Dux Britanniarum*, who had charge of the forces in the north, and the *Comes Littoris Saxonici*, whose task it was to defend the south-east line. The Welsh texts never call Arthur *gwledig* (prince), but *amheradawr* (Latin *imperator*) or emperor, a title which would be bestowed on the highest official in the island. The truth thus appears to be that, while there was never a *King* Arthur, there was a noted chieftain and general of that name. If we say that he carried on a successful

war against the Saxons, was probably betrayed by his wife and a near kinsman, and fell in battle, we have stated all which can be claimed as an historical nucleus for his legend. It is now generally admitted that the representation of Arthur as world conqueror, *Welt-Kaiser*, is due to the influence of the Charlemagne cycle. In the 12th century the *Matière de France* was waning, the *Matière de Bretagne* waxing in popularity, and public opinion demanded that the central figure of the younger cycle (for whatever the date of the subject matter, as a literary cycle the Arthurian is the younger) should not be inferior in dignity and importance to that of the earlier. When we add to this the fact that the writers of the 12th century represented the personages and events of the 6th in the garb, and under the conditions, of their own time, we can understand the reason of the manifold difficulties which beset the study of the cycle.

But into the figure of Arthur as we know him, other elements have entered; he is not merely an historic personality, but at the same time a survival of pre-historic myth, a hero of romance, and a fairy king; and all these threads are woven together in one fascinating but bewildering web. It is only possible here to summarize the leading features which may be claimed as characteristic of each phase.

Mythic.—Certain elements of the story point to Arthur as a culture hero; as such his name has been identified with the *Mercurius Artaius* of the Gauls. In this role he slays monsters, the boar Twrch Trwyth, the giant of Mont St Michel and the Demon Cat of Losanne (André de Coutances tells us that Arthur was really vanquished and carried off by the Cat, but that one durst not tell that tale before Britons!). He never, it should be noted, rides on purely chivalric ventures, such as aiding distressed damsels, seeking the Grail, &c. His expeditions are all more or less warlike. The story of his youth belongs, as Alfred Nutt (*Folk-lore*, vol. iv.) has shown, to the group of tales classified as the *Aryan Expulsion and Return* formula, found in all Aryan lands. Numerous parallels exist between the Arthurian and early Irish heroic cycles, notably the Fenian or Ossianic. This Fenian cycle is very closely connected with the Tuatha de Danaan, the Celtic deities of vegetation and increase; recent research has shown that two notable features of the Arthurian story, the Round Table and the Grail, can be most reasonably accounted for as survivals of this Nature worship, and were probably parts of the legend from the first.

Romantic.—The character of Arthur as a romantic hero is, in reality, very different from that which, mainly through the popularity of Tennyson's *Idylls*, English people

are wont to suppose. In the earlier poems he is practically a lay figure, his court the point of departure and return for the knights whose adventures are related in detail, but he himself a passive spectator. In the prose romances he is a monarch, the splendour of whose court, whose riches and generosity, are the admiration of all; but morally he is no whit different from the knights who surround him; he takes advantage of his *bonnes fortunes* as do others. He has two sons, neither of them born in wedlock; one, Modred, is alike his son and his nephew. In certain romances, the *Perlesvaus* and *Diu Crône*, he is a veritable *roi fainéant*, overcome by sloth and luxury. Certain traits of his story appear to show the influence of Northern romance. Such is the story of his begetting, where Uther takes upon him the form of Gorlois to deceive Yguerne, even as Siegfried changed shapes with Gunther to the undoing of Brünnhilde. The sword in the perron (stone pillar or block), the withdrawal of which proves his right to the kingdom, is the sword of the Branstock. Morgain carries him off, mortally wounded, to Avalon, even as the Valkyr bears the Northern hero to Valhal. Morgain herself has many traits in common with the Valkyrie; she is one of nine sisters, she can fly through the air as a bird (Swan maiden); she possesses a marvellous ointment (as does Hilde, the typical Valkyr). The idea of a slumbering hero who shall awake at the hour of his country's greatest need is world-wide, but the most famous instances are Northern, *e.g.* Olger Danske and Barbarossa, and depend ultimately on an identification with the gods of the Northern Pantheon, notably Thor. W. Larminie cited an instance of a rhyme current in the Orkneys as a charm against nightmare, which confuses Arthur with Siegfried and his winning of the Valkyr.

Fairy.—We find that at Arthur's birth (according to Layamon, who here differs from Wace), three ladies appeared and prophesied his future greatness. This incident is also found in the first continuation to the *Perceval*, where the prediction is due to a lady met with beside a forest spring, clearly here a water fairy. In the late romance of *La Bataille de Loquifer* Avalon has become a purely fairy kingdom, where Arthur rules in conjunction with Morgain. In *Huon de Bordeaux* he is Oberon's heir and successor, while in the romance of *Brun de la Montagne*, preserved in a unique MS. of the Bibliothèque Nationale, we have the curious statement that all fairy-haunted places, wherever found, belong to Arthur:—

"Et touz ces lieux faés
Sont Artus de Bretagne."

This brief summary of the leading features of the Arthurian tradition will indicate with what confused and complex material we are here dealing. (See also ARTHURIAN LEGEND, GRAIL, MERLIN, ROUND TABLE; and CELT: *Celtic literature*.)

Texts. Historic:—Nennius, *Historia Britonum*; H. Zimmer, *Nennius Vindicatus* (Berlin, 1893), an examination into the credibility of Nennius; Geoffrey of Monmouth, *Historia Britonum* (translations of both histories are in Bohn's Library); Wace, the *Brut* (ed. by Leroux de Lincey); Layamon (ed. by Sir Fred. Madden).

Romantic:—*Merlin*—alike in the Ordinary, or Vulgate (ed. Sommer), the *Suite* or "Huth" *Merlin*, the 13th century *Merlin* (ed. by G. Paris and J. Ulrich), and the unpublished and unique version of *Bibl. nat. fonds français*, 337 (cf. Freymond's analysis in *Zeitschrift für franz. Sprache*, xxii.)—devotes considerable space to the elaboration of the material supplied by the chronicles, the beginning of Arthur's reign, his marriage and wars with the Saxons. The imitation of the Charlemagne romances is here evident; the Saxons bear names of Saracen origin, and camels and elephants appear on the scene. The *Morte Arthur*, or *Mort au roi Artus*, a metrical romance, of which a unique English version exists in the Thornton collection (ed. for Early English Text Society), gives an expanded account of the passing of Arthur; in the French prose form it is now always found incorporated with the *Lancelot*, of which it forms the concluding section. The remains of the Welsh tradition are to be found in the *Mabinogion* (cf. Nutt's edition, where the stories are correctly classified), and in the Triads. Professor Rhys' *Studies in the Arthurian Legend* are largely based on Welsh material, and may be consulted for details, though the conclusions drawn are not in harmony with recent research. These are the only texts in which Arthur is the central figure; in the great bulk of the romances his is but a subordinate rôle.

(J. L. W.)

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1 Nor all a lie, nor all true, nor all fable, nor all known, so much have the story-tellers told, and the fablers fabled, in order to embellish their tales, that they have made all seem fable.

ARTHUR I. (1187-1203), duke of Brittany, was the posthumous son of Geoffrey, the fourth son of Henry II. of England, and Constance, heiress of Conan IV., duke of Brittany. The Bretons hoped that their young prince would uphold their independence, which was threatened by the English. Henry II. tried to seize Brittany, and in 1187 forced Constance to marry one of his favourites, Randulph de Blundevill, earl of Chester (d. 1232). Henry, however, died soon afterwards (1189). The new king of England, Richard Cœur de Lion, claimed the guardianship of the young Arthur, but in 1190 Richard left for the Crusade. Constance profited by his absence by governing the duchy, and in 1194 she had Arthur proclaimed duke of Brittany by an assembly of barons and bishops. Richard invaded Brittany in 1196, but was defeated in 1197 and became reconciled to Constance. On his death in 1189, the nobles of Anjou, Maine and Touraine refused to recognize John of England, and did homage to Arthur, who declared himself the vassal of Philip Augustus. In 1202 war was resumed between the king of England and the king of France. The king of France recognized Arthur's right to Brittany, Anjou, Maine and Poitou. While Philip Augustus was invading Normandy, Arthur tried to seize Poitou. But, surprised at Mirebeau, he fell into the hands of John, who sent him prisoner to Falaise. In the following year he was transferred to Rouen, and disappeared suddenly. It is thought that John killed him with his own hand. After this murder John was condemned by the court of peers of France, and stripped of the fiefs which he possessed in France.

See Ralph of Coggeshall, "Chronicon Anglicanum," in the *Monumenta Britanniae historica*; Dom Lobineau, *Histoire de Bretagne* (1702); Dom Morice, *Histoire de Bretagne* (1742-1756); A. de la Borderie, *Histoire de Bretagne*, vol. iii. (1899); Bémont, "De la condamnation de Jean-sans-Terre par la Cour des Pairs de France," in the *Revue historique* (1886), vol. xxxii.

ARTHUR III. (1393-1458), earl of Richmond, constable of France, and afterwards duke of Brittany, was the third son of John IV., duke of Brittany, and Joan of Navarre, afterwards the wife of Henry IV. of England. His brother, John V., gave him his

earldom of Richmond in England. While still very young, he took part in the civil wars which desolated France during the reign of Charles VI. From 1410 to 1414 he served on the side of the Armagnacs, and afterwards entered the service of Louis the dauphin, whose intimate friend he became. He profited by his position at court to obtain the lieutenancy of the Bastille, the governorship of the duchy of Nemours, and the confiscated territories of Jean Larchevêque, seigneur of Parthenay. His efforts to reduce the latter were, however, interrupted by the necessity of marching against the English. At Agincourt he was wounded and captured, and remained a prisoner in England from 1415 to 1420. Released on parole, he gained the favour of King Henry V. by persuading his brother, the duke of Brittany, to conclude the treaty of Troyes, by which France was handed over to the English king. He was rewarded with the countship of Ivry.

In 1423 Arthur married Margaret of Burgundy, widow of the dauphin Louis, and became thus the brother-in-law of Philip the Good of Burgundy, and of the regent, the duke of Bedford. Offended, however, by Bedford's refusal to give him a high command, he severed his connexion with the English, and in March 1425 accepted the constable's sword from King Charles VII. He now threw himself with ardour into the French cause, and persuaded his brother, John V. of Brittany, to conclude with Charles VII. the treaty of Saumur (October 7, 1425). But though he saw clearly enough the measures necessary for success, he lacked the means to carry them out. In the field he met with a whole series of reverses; and at court, where his rough and overbearing manners made him disliked, his influence was overshadowed by that of a series of incompetent favourites. The peace concluded between the duke of Brittany and the English in September 1427 led to his expulsion from the court, where Georges de la Trémoille, whom he himself had recommended to the king, remained supreme for six years, during which Richmond tried in vain to overthrow him. In the meantime, in June 1429, he joined Joan of Arc at Orleans, and fought in several battles under her banner, till the influence of La Trémoille forced his withdrawal from the army. On the 5th of March 1432 Charles VII. concluded with him and with Brittany the treaty of Rennes; but it was not until June of the following year that La Trémoille was overthrown. Arthur now resumed the war against the English, and at the same time took vigorous measures against the plundering bands of soldiers and peasants known as *routiers* or *écorcheurs*. On the 20th of September 1435, mainly as a result of his diplomacy, was

signed the treaty of Arras between Charles VII. and the duke of Burgundy, to which France owed her salvation.

On the 13th of April 1436, Arthur took Paris from the English; but he was ill seconded by the king, and hampered by the necessity for leading frequent expeditions against the *écorcheurs*; it was not till May 1444 that the armistice of Tours gave him leisure to carry out the reorganization of the army which he had long projected. He now created the *compagnies d'ordonnance*, and endeavoured to organize the militia of the *francs archers*. This reform had its effect in the struggles that followed. In alliance with his nephew, the duke of Brittany, he reconquered, during September and October 1449, nearly all the Cotentin; on the 15th of April 1450 he gained over the English the battle of Formigny; and during the year he recovered for France the whole of Normandy, which for the next six or seven years it was his task to defend from English attacks. On the death of his nephew Peter II., on the 22nd of September 1457, he became duke of Brittany, and though retaining his office of constable of France, he refused, like his predecessors, to do homage to the French king for his duchy. He reigned little more than a year, dying on the 26th of December 1458, and was succeeded by his nephew Francis II., son of his brother Richard, count of Étampes.

Arthur was three times married: (1) to Margaret of Burgundy, duchess of Guienne (d. 1442); (2) to Jeanne d'Albret, daughter of Charles II. of Albret (d. 1444); (3) to Catherine of Luxemburg, daughter of Peter of Luxemburg, count of St Pol, who survived him. He left no legitimate children.

AUTHORITIES.—The main source for the life of Duke Arthur III. is the chronicle of Guillaume Gruel (*c.* 1410-1474-1482). Gruel entered the service of the earl of Richmond about 1425, shared in all his campaigns, and lived with him on intimate terms. The chronicle covers the whole period of the duke's life, but the earlier part, up to 1425, is much less full and important than the later, which is based on Gruel's personal knowledge and observation. In spite of a perhaps exaggerated admiration for his hero, Gruel displays in his work so much good faith, insight and originality that he is accepted as a thoroughly trustworthy authority. It was first published at Paris in 1622. Of the numerous later editions, the best is that of Achille le Vavasseur, *Chronique d'Arthur de Richemont* (Paris, 1890). See also E. Cosneau, *Le Connétable de Richemont* (Paris, 1886); G. du Fresne de Beaucourt, *Histoire de Charles VII.* (Paris, 1881, seq.).

ARTHUR, CHESTER ALAN (1830-1886), twenty-first president of the United States, was born in Fairfield, Vermont, on the 5th of October 1830. His father, William Arthur (1796-1875), when eighteen years of age, emigrated from Co. Antrim, Ireland, and, after teaching in various places in Vermont and Lower Canada, became a Baptist minister. William Arthur had married Malvina Stone, an American girl who lived at the time of the marriage in Canada, and the numerous changes of the family residence afforded a basis for allegations in 1880 that the son Chester was born not in Vermont, but in Canada, and was therefore ineligible for the presidency. Chester entered Union College as a sophomore, and graduated with honour in 1848. He then became a schoolmaster, at the same time studying law. In 1853 he entered a law office in New York city, and in the following year was admitted to the bar. His reputation as a lawyer began with his connexion with the famous "Lemmon slave case," in which, as one of the special counsel for the state, he secured a decision from the highest state courts that slaves brought into New York while in transit between two slave states were *ipso facto* free. In another noted case, in 1855, he obtained a decision that negroes were entitled to the same accommodations as whites on the street railways of New York city. In politics he was actively associated from the outset with the Republican party. When the Civil War began he held the position of engineer-in-chief on Governor Edwin D. Morgan's staff, and afterwards became successively acting quartermaster-general, inspector-general, and quartermaster-general of the state troops, in which capacities he showed much administrative efficiency. At the close of Governor Morgan's term, on the 31st of December 1862, General Arthur resumed the practice of his profession, remaining active, however, in party politics in New York city. In November 1871 he was appointed by President U.S. Grant collector of customs for the port of New York. The custom-house had long been conspicuous for the most flagrant abuses of the "spoils system"; and though General Arthur admitted that the evils existed and that they rendered efficient administration impossible, he made no extensive reforms. In 1877 President Rutherford B. Hayes began the reform of the civil service with the New York custom-house. A non-partisan commission, appointed by Secretary John Sherman, recommended sweeping changes. The president demanded the resignation of

Arthur and his two principal subordinates, George H. Sharpe, the surveyor, and Alonzo B. Cornell, the naval officer, of the Port. General Arthur refused to resign on the ground that to retire "under fire" would be to acknowledge wrong-doing, and claimed that as the abuses were inherent in a widespread system he should not be made to bear the responsibility alone. His cause was espoused by Senator Roscoe Conkling, for a time successfully; but on the 11th of July 1878, during a recess of the Senate, the collector was removed, and in January 1879, after another severe struggle, this action received the approval of the Senate. In 1880 General Arthur was a delegate at large from New York to the Republican national convention. In common with the rest of the "Stalwarts," he worked hard for the nomination of Gen. U.S. Grant for a third term. Upon the triumph of James A. Garfield, the necessity of conciliating the defeated faction led to the hasty acceptance of Arthur for the second place on the ticket. His nomination was coldly received by the public; and when, after his election and accession, he actively engaged on behalf of Conkling in the great conflict with Garfield over the New York patronage, the impression was widespread that he was unworthy of his position. Upon the death of President Garfield, on the 19th of September 1881, Arthur took the oath as his successor. Contrary to the general expectation, his appointments were as a rule unexceptionable, and he earnestly promoted the Pendleton law for the reform of the civil service. His use of the veto in 1882 in the cases of a Chinese Immigration Bill (prohibiting immigration of Chinese for twenty years) and a River and Harbour Bill (appropriating over $18,000,000, to be expended on many insignificant as well as important streams) confirmed the favourable impression which had been made. The most important events of his administration were the passage of the Tariff Act of 1883 and of the "Edmunds Law" prohibiting polygamy in the territories, and the completion of three great trans-continental railways—the Southern Pacific, the Northern Pacific, and the Atchison, Topeka & Santa Fé. His administration was lacking in political situations of a dramatic character, but on all questions that arose his policy was sane and dignified. In 1884 he allowed his name to be presented for renomination in the Republican convention, but he was easily defeated by the friends of James G. Blaine. At the expiration of his term he resumed his residence in New York city, where he died on the 18th of November 1886.

For an account of his administration see UNITED STATES: *History*.

ARTHURIAN LEGEND. By the "Arthurian legend," or *Matière de Brelagne*, we mean the subject-matter of that important body of medieval literature known as the Arthurian cycle (see ARTHUR). The period covered by the texts in their present form represents, roughly speaking, the century 1150-1250. The *History* of Nennius is, of course, considerably earlier, and that of Geoffrey of Monmouth somewhat antedates 1150 (1136), but with these exceptions the dates above given will be found to cover the composition of all our extant texts.

As to the origin of this *Matière de Bretagne*, and the circumstances under which it became a favourite theme for literary treatment, two diametrically opposite theories are held. One body of scholars, headed by Professor Wendelin Förster of Bonn, while admitting that, so far as any historic basis can be traced, the events recorded must have happened on insular ground, maintain that the knowledge of these events, and their romantic development, are due entirely to the Bretons of the continent. The British who fled before the Teutonic and Scandinavian invasions of the 6th and 8th centuries, had carried with them to Armorica, and fondly cherished, the remembrance of Arthur and his deeds, which in time had become interwoven with traditions of purely Breton origin. On the other side of the Channel, *i.e.* in Arthur's own land, these memories had died out, or at most survived only as the faint echo of historic tradition. Through the medium of French-speaking Bretons these tales came to the cognizance of Northern French poets, notably Chrétien de Troyes, who wove them into romances. According to Professor Förster there were no Arthurian romances previous to Chrétien, and equally, of course, no insular romantic tradition. This theory reposes mainly on the supposed absence of pre-Chrétien poems, and on the writings of Professor H. Zimmer, who derives the Arthurian names largely from Breton roots. This represents the prevailing standpoint of German scholars, and may be called the "continental" theory. In opposition to this the school of which the late Gaston Paris was the leading, and most brilliant, representative, maintains that the Arthurian tradition, romantic equally with historic, was preserved in Wales through the medium of the bards, was by them communicated to their Norman conquerors, worked up into poems by the Anglo-Normans, and by them transmitted to the continental poets. This, the "insular" theory, in spite of its inherent probability, has hitherto been at a disadvantage through lack of positive evidence, but in a recently acquired MS. of the British Museum, Add. 36614, we find the first continuator of the *Perceval*, Wauchier de Denain, quoting as authority for stories of Gawain a certain Bleheris, whom he states to have been "born and bred in

Wales." The identity of this Bleheris with the Bledhericus mentioned by Giraldus Cambrensis as *Famosus ille fabulator*, living at a bygone and unspecified date, and with the Bréri quoted by Thomas as authority for the *Tristan* story, has been fully accepted by leading French scholars. Further, on the evidence of certain MSS. of the *Perceval*, notably the Paris MS. (Bibl. Nat. 1450), it is clear that Chrétien was using, and using freely, the work of a predecessor, large fragments of which have been preserved by the copyists who completed his unfinished work. The evidence of recent discoveries is all in favour of the insular, or French, view.

So far as the character, as distinguished from the *provenance*, of this subject-matter is concerned, it is largely of folk-lore origin, representing the working over of traditions, in some cases (as *e.g.* in the account of Arthur's birth and upbringing) common to all the Aryan peoples, in others specifically Celtic. Thus there are a number of parallels between the Arthurian and the Irish heroic cycles, the precise nature of which has yet to be determined. So far as Arthur himself is concerned these parallels are with the Fenian, or Ossianic, cycle, in the case of Gawain with the Ultonian.

In its literary form the cycle falls into three groups:—pseudo-historic: the *Histories* of Nennius and Geoffrey, the *Brut* of Wace and Layamon (see ARTHUR); poetic: the works of Chrétien de Troyes, Thomas, Raoul de Houdenc and others (see GAWAIN, PERCEVAL, TRISTAN, and the writers named above); prose: the largest and most important group (see GRAIL, LANCELOT, MERLIN, TRISTAN). Of these three branches the prose romances offer the most insuperable problems; none can be dated with any certainty; all are of enormous length; and all have undergone several redactions. Of not one do we as yet possess a critical and comparative text, and in the absence of such texts the publication of any definite and detailed theory as to the evolution and relative position of the separate branches of the Arthurian cycle is to be deprecated. The material is so vast in extent, and in so chaotic a condition, that the construction of any such theory is only calculated to invite refutation and discredit.

The best general study of the cycle is to be found in Gaston Paris's manual *La Littérature française au moyen âge* (new and revised edition, 1905). See also the introduction to vol. xxx. of *Histoire littéraire de la France*. For the theories as to origin, see the Introductions to Professor Förster's editions of the poems of Chrétien de Troyes, notably that to vol. iv., *Der Karrenritter*, which is a long and elaborate restating of his position. Also Professor H. Zimmer's articles in *Gottingische gelehrte Anzeigen*, 12 and 20. For the Insular view, Ferd. Lot's "Études sur la provenance du cycle arthurien," *Romania*, vols. xxiv.-xxviii., are very valuable. For a popular treatment of the subject, cf. Nos. i. and iv. of *Popular Studies in Romance and Folk-lore* (Nutt). Robert Huntington Fletcher's "The Arthurian Matter in the Chronicles" (vol. x. of *Harvard Studies and Notes in Philology and Literature*), is a most useful summary.

(J. L. W.)

ARTICHOKE. The common artichoke, *Cynara, scolymus*, is a plant belonging to the natural order Compositae, having some resemblance to a large thistle. It has long been esteemed as a culinary vegetable; the parts chiefly employed being the immature receptacle or floret disk, with the lower part of the surrounding leaf-scales, which are known as "artichoke bottoms." In Italy the receptacles, dried, are largely used in soups; those of the cultivated plant as *Carciofo domestico*, and of the wild variety as *Carciofo spinoso*.

The Jerusalem artichoke, *Helianthus tuberosus*, is a distinct plant belonging to the same order, cultivated for its tubers. It closely resembles the sunflower, and its popular name is a corruption of the Italian *Girasole Articiocco*, the sunflower artichoke. It is a native of Canada and the north-eastern United States, and was cultivated by the aborigines. The tubers are rich in the carbohydrate inulin and in sugar.

The name is derived from the northern Italian *articiocco*, or *arciciocco*, modern *carciofo*; these words come, through the Spanish, from the Arabic *al-kharshūf*. False etymology has corrupted the word in many languages: it has been derived in English from "choke," and "heart," or the Latin *hortus*, a garden; and in French, the form *artichaut* has been connected with *chaud*, hot, and *chou*, a cabbage.

ARTICLE (from Lat. *articulus*, a joint), a term primarily for that which connects two parts together, and so transferred to the parts thus joined; thus the word is used of the separate clauses or heads in contracts, treaties or statutes and the like; of a literary composition on some specific subject in a

periodical; or of particular commodities, as in “articles of trade and commerce.” It appears also in the phrase “in the article of death” to translate *in articulo mortis*, at the moment of death. In grammar the term is used of the adjectives which state the extension of a substantive, *i.e.* the number of individuals to which a name applies; the indefinite article denoting one or any of a particular class, the definite denoting a particular member of a class.

ARTICLES OF ASSOCIATION, in English company law, the regulations for the internal management of a joint stock company registered under the Companies Acts. They are, in fact, the terms of the partnership agreed upon by the shareholders among themselves. They regulate such matters as the transfer and forfeiture of shares, calls upon shares, the appointment and qualification of directors, their powers and proceedings, general meetings of the shareholders, votes, dividends, the keeping and audit of accounts, and other such matters. In regard to these internal regulations the legislature has left the company free to adopt whatever terms of association it chooses. It has furnished in the schedule to the Companies Act 1862 (Table A), a model or specimen set of regulations, but their adoption, wholly or in part, is optional; only if a company does not register articles of its own these statutory regulations are to apply. When, as is commonly the case, a company decides to have articles of its own framing, such articles must be expressed in separate paragraphs, numbered arithmetically, and signed by the subscribers of the memorandum of association. They must also be printed, stamped like a deed, and attested. When so perfected, they are to be delivered, with the memorandum of association, to the registrar of joint stock companies, who is to retain and register them. The articles of association thereupon become a public document, which any person may inspect on payment of a fee of one shilling. This has important consequences, because every person dealing with the company is presumed to be acquainted with its constitution, and to have read its articles. The articles, also, upon registration, bind the company and its members to the same extent as if each member had subscribed his name and affixed his seal to them. (See also MEMORANDUM OF ASSOCIATION; COMPANY; INCORPORATION.)

In the United States, articles of association are any instrument in writing which sets forth the purposes, the terms and conditions upon which a body of persons have united for the prosecution of a joint enterprise. When this instrument is duly executed and filed, the law gives it the force and effects of a charter of incorporation.

ARTICULATA, a zoological name now obsolete, applied by Cuvier to animals, such as insects and worms, in which the body displays a jointed structure. (See ARTHROPODA.)

ARTICULATION (from Lat. *articulare*, to divide into joints), the act of joining together; in anatomy the junction of the bones (see JOINTS); in botany the point of attachment and separation of the deciduous parts of a plant, such as a leaf. The word is also used for division into distinct parts, as of human speech by words or syllables.

ARTILLERY (the O. Fr. *artiller*, to equip with engines of war, probably comes from Late Lat. *articulum*, dim. of *ars*, art, cf. "engine" from *ingenium*, or of *artus*, joint), a term originally applied to all engines for discharging missiles, and in this sense used in English in the early 17th century. In a more restricted sense, artillery has come to mean all firearms not carried and used by hand, and also the *personnel* and organization by which the power of such weapons is wielded. It is, however, not usual to class *machine guns* (*q.v.*) as artillery. The present article deals with the development and contemporary state of the artillery arm in land warfare, in respect of its organization, personnel and special or "formal" employment. For the *matériel*—the guns, their carriages and their ammunition—see ORDNANCE and AMMUNITION. For *ballistics*, see that heading, and for the work of artillery in combination with the other arms, see TACTICS.

Artillery, as distinct from ordnance, is usually classified in accordance with the functions it has to perform. The simplest division is that into *mobile* and *immobile* artillery, the former being concerned with the handling of all weapons so mounted as to be capable of more or less easy movement from place to place, the latter with that of weapons which are installed in fixed positions. Mobile artillery is subdivided, again chiefly in respect of its employment, into *horse* and *field* batteries, *heavy field* or *position* artillery, *field howitzers, mountain artillery* and *siege trains*, adapted to every kind of terrain in which field troops may be employed, and work they may have to do. Immobile artillery is used in fixed positions of all kinds, and above all in permanent fortifications; it cannot, therefore, be classified as above, inasmuch as the *raison d'être*, and consequently the armament of one fort or battery may be totally distinct from that of another. "Fortress," "Garrison" and "Foot" artillery are the usual names for this branch. The dividing line, indeed, in the case of the heavier weapons, varies with circumstances; guns of position may remain on their ground while elaborate fortifications grow up around them, or the deficiencies of a field army in artillery may be made good from the *matériel*, more frequently still from

the *personnel*, of the fortress artillery. Thus it may happen that mobile artillery becomes immobile and vice versa. But under normal circumstances the principle of classification indicated is maintained in all organized military forces.

Historical Sketch

1. *Early Artillery.*—Mechanical appliances for throwing projectiles were produced early in the history of organized warfare, and "engines invented by cunning men to shoot arrows and great stones" are mentioned in the Old Testament. These were continually improved, and, under the various names of *catapulta, balista, onager, trébuchet*, &c., were employed throughout the ancient and medieval periods of warfare. The machines finally produced were very powerful, and, even when a propelling agent so strong as gunpowder was discovered and applied, the supersession of the older weapons was not effected suddenly nor without considerable opposition. The date of the first employment of cannon cannot be established with any certainty, but there is good evidence to show that the Germans used guns at the siege of Cividale in Italy (1331). The terms of a commission given (1414) by Henry V. to his *magister operationum, ingeniarum, et gunnarum ac aliarum ordinationum*, one Nicholas Merbury, show that the organization of artillery establishments was grafted upon that which was already in existence for the service of the old-fashioned machines. Previously to this it is recorded that of some 340 men forming the ordnance establishment of Edward III. in 1344 only 12 were artillerymen and gunners. Two years later, at Creçy, it is said, the English brought guns into the open field for the first time. At the siege of Harfleur (1415) the ordnance establishment included 25 "master gunners" and 50 "servitour gunners." The "gunner" appears to have been the captain of the gun, with general charge of the guns and stores, and the special duty of laying and firing the piece in action.

2. *The Beginnings of Field Artillery.*—It is clear, from such evidence as we possess, that the chief and almost the only use of guns at this time was to batter the walls of fortifications, and it is not until later in the 15th century that their employment in the field became general (see also Cavalry). The introduction of field artillery may be attributed to John Žižka, and it was in his Hussite wars (1419-1424) that the *Wagenburg*, a term of more general application, but taken here as denoting a cart or vehicle armed with several small guns, came into prominence. This device allowed a relatively high manœuvring power to be attained, and it is found occasionally in European wars two centuries later, as for instance at Wimpfen in 1622 and Cropredy Bridge in 1644. In an act of attainder passed by the Lancastrian party against the Yorkists (1459), it is stated that the latter were "traiterously ranged in bataill ... their cartes with gonnes set before their batailles" (Rot. Parl. 38 Henry VI., v. 348). In the London fighting of 1460, small guns were used to clear the streets, heavy ordnance to batter the walls of the Tower. The battle of Lose Coat Field (1469) was decided almost entirely by Edward IV.'s field guns, while at Blackheath (1497) "some cornets of horse, and bandes of foot, and good store of artillery wheeling about" were sent to "put themselves beyond" the rebel camp (Bacon, *Henry VII.*). The greatest example of artillery work in the 15th century was the siege of Constantinople in 1453, at which the Turks used a large force of artillery, and in particular some monster pieces, some of which survived to engage a British squadron in 1807, when a stone shot weighing some 700 ℔ cut the mainmast of Admiral (Sir) J.T. Duckworth's flagship in two, and another killed and wounded sixty men. For siege purposes the new weapon was indeed highly

effective, and the castles of rebellious barons were easily knocked to pieces by the prince who owned, or succeeded in borrowing, a few pieces of ordnance (cf. Carlyle, *Frederick the Great*, book iii. chap. i.).

3. *The 16th Century.*—In the Italian wars waged by Charles VIII., Louis XII. and Francis I. of France, artillery played a most conspicuous part, both in siege and field warfare. Indeed, cannon did excellent service in the field before hand firearms attained any considerable importance. At Ravenna (1512) and Marignan (1515) field artillery did great execution, and at the latter battle "the French artillery played a new and distinguished part, not only by protecting the centre of the army from the charges of the Swiss phalanxes, and causing them excessive loss, but also by rapidly taking up such positions from time to time ... as enabled the guns to play upon the flanks of the attacking columns" (Chesney, *Observations on Firearms*, 1852). In this connexion it must, however, be observed that, when the arquebus and other small arms became really efficient (about 1525), less is heard of this small and handy field artillery, which had hitherto been the only means of breaking up the heavy masses of the hostile pikemen. We have seen that artillery was not ignored in England; but, in view of the splendid and unique efficiency of the archers, there was no great opportunity of developing the new arm. In the time of Henry VIII., the ordnance in use in the field consisted in the main of heavy *culverins* and other guns of position, and of lighter field pieces, termed *sakers, falcons*, &c. It is to be noticed that already the lightest pieces had disappeared, the smallest of the above being a 2-pounder. In the earlier days of field artillery, the artillery train was a miscellaneous congeries of pontoon, supply, baggage and tool wagons, heavy ordnance and light guns in carts. With the development of infantry fire the use of the last-named weapons died out, and it is largely due to this fact that "artillery" came to imply cumbrous and immobile guns of position. Little is, therefore, heard of smart manoeuvring, such as that at Marignan, during the latter part of the 16th century. The guns now usually come into action in advance of the troops, but, from their want of mobility, could neither accompany a farther advance nor protect a retreat, and they were generally captured and recaptured with every changing phase of the fight. Great progress was in the meanwhile made in the adaptation of ordnance to the attack and defence of fortresses and, in particular, vertical fire came into vogue. A great Turkish gun, carrying a 600-lb stone shot, was used in the siege of Constantinople, apparently in this way, since Gibbon records that at the range of a mile the shot buried itself a fathom deep in earth, a fact which implies that a high angle of elevation was given. In the celebrated siege of Malta in 1565 artillery played a conspicuous part.

4. *The Thirty Years' War.*—Such, in its broadest outlines, is the history of artillery work during the first three centuries of its existence. Whilst the material had undergone a very considerable improvement, the organization remained almost unchanged, and the tactical employment of guns had become restricted, owing to their slowness and difficulty of movement on the march and immobility in action. In wars of the type of the War of Dutch Independence and the earlier part of the Thirty Years' War, this heavy artillery naturally remained useful enough, and the *Wagenburg* had given place to the musketry initiated by the Spaniards at Bicocca and Pavia, which since 1525 had steadily improved and developed. It is not, therefore, until the appearance of a captain whose secret of success was vigour and mobility that the first serious attempt was made to produce field artillery in the proper sense of the word, that is, a gun of good power, and at the same time so mounted as to be capable of rapid movement. The "carte with gonnes" had been, as is the modern machine gun, a mechanical concentration of musketry rather than a piece of artillery. Maurice of Nassau, indeed, helped to develop the field gun, and the

French had invented the limber, but Gustavus Adolphus was the first to give artillery its true position on the battlefield. At the first battle of Breitenfeld (1631) Gustavus had twelve heavy and forty-two light guns engaged, as against Tilly's heavy 24-pounders, which were naturally far too cumbrous for field work. At the Lech (1632) Gustavus seems to have obtained a local superiority over his opponent owing to the handiness of his field artillery even more than by its fire-power. At Lützen (1632) he had sixty guns to Wallenstein's twenty-one. His field pieces were not the celebrated "leather" guns (which were indeed a mere makeshift used in Gustavus' Polish wars) but iron 4-pounders. These were distributed amongst the infantry units, and thus began the system of "battalion guns" which survived in the armies of Europe long after the conditions requiring it had vanished. The object of thus dispersing the guns was doubtless to ensure in the first place more certain co-operation between the two arms, and in the second to exercise a military supervision over the lighter and more useful field pieces which it was as yet impossible to exercise over the *personnel* of the heavy artillery.

5. *Personnel and Classification.*—More than 300 years after the first employment of ordnance, the men working the guns and the transport drivers were still civilians. The actual commander of the artillery was indeed, both in Germany and in England, usually a soldier, and Lennart Torstensson, the commander of Gustavus' artillery, became a brilliant and successful general. But the transport and the drivers were still hired, and even the gunners were chiefly concerned for the safety of their pieces, the latter being often the property, not of the king waging war, but of some "master gunner" whose services he had secured, and the latter's apprentices were usually in entire charge of the material. These civilian "artists," as they were termed, owed no more duty to the prince than any other employés, and even Gustavus, it would appear, made no great improvement in the matter of the reorganization of artillery trains. Soldiers as drivers do not appear until 150 years later, and in the meanwhile companies of "firelocks" and "fusiliers" (*q.v.*) came into existence, as much to prevent the gunners and drivers from running away as to protect them from the enemy. A further cause of difficulties, in England at any rate, was the age of the "gunners." In the reign of Elizabeth, some of the Tower gunners were over ninety years of age. Complaints as to the inefficiency of these men are frequent in the years preceding the English Civil War. Gustavus, however, has the merit of being the first to make the broad classification of artillery, as mobile or non-mobile, which has since been almost universally in force. In his time the 12-pounder was the heaviest gun classed as mobile, and the "feildpeece" *par excellence* was the 9-pounder or *demi-culverin*. After the death of Gustavus at Lützen (1632), his principles came universally into practice, and amongst them were those of the employment of field artillery.

6. *The English Civil War.*—Even in the English Civil War (Great Rebellion), in which artillery was hampered by the previous neglect of a century, its field work was not often contemptible, and on occasion the arm did excellent service. But in the campaigns of this war, fought out by men whose most ardent desire was to decide the quarrel swiftly, the marching and manoeuvring were unusually rapid. The consequence of this was that the guns were sometimes either late in arriving, as at Edgehill, or absent altogether, as at Preston. The *rôle* of guns was further reduced by the fact that there were few fortresses to be reduced, and country houses, however strong, rarely required to be battered by a siege train. The New Model army usually sent for siege guns only when they were needed for particular service. On such occasions, indeed, the heavy ordnance did its work so quickly and effectually that the assault often took place one or two days after the guns had opened fire. Cromwell in his sieges made

great use of shells, 12-inch and even larger mortars being employed. The castle of Devizes, which had successfully resisted the Parliamentary battering guns, succumbed at once to vertical fire. It does not, however, appear certain that there was any separation of field from siege ordnance, although the Swedish system was followed in almost all military matters.

7. *Artillery Progress, 1660-1740.*—Cromwell's practice of relegating heavy guns to the rear, except when a serious siege operation was in view, and in very rapid movements leaving even the field pieces far behind, was followed to some extent in the campaigns of the age of Louis XIV. The number of ammunition wagons, and above all of horses, required for each gun was four or five times as great as that required even for a modern quick-firer. In the days of Turenne heavy guns were much employed, as the campaigns of the French were directed as a rule to the methodical conquest of territory and fortified towns. Similarly, Marlborough, working amidst the fortresses of the Netherlands in 1706, had over 100 pieces of artillery (of which 60 were mortars) to a force of some 11,000 men, or about 9 pieces per 1000 men. On the other hand, in his celebrated march to the Danube in 1704, he had but few guns, and the allied armies at Blenheim brought into the field only 1 piece per 1000 men. At Oudenarde "from the *rapidity of the march* ... the battle was fought with little aid from artillery on either side" (Coxe, *Marlborough*). There was less need now than ever before for rapid manœuvres of mobile artillery, since the pike finally disappeared from the scene about 1700, and infantry fire-power had become the decisive factor in battles. In the meantime, artillery was gradually ceasing to be the province of the skilled workman, and assuming its position as an arm of the military service. In the 17th century, when armies were as a rule raised only "for the war" and disbanded at the conclusion of hostilities, there had been no very pressing need for the maintenance in peace of an expensive *personnel* and material. Gunners therefore remained, as civilians, outside the regular administration of the forces, until the general adoption of the "standing army" principle in the last years of the century (see ARMY). From this time steps were taken, in all countries, to organize the artillery as a military force. After various attempts had been made, the "Royal Regiment of Artillery" came into existence in England in 1716. It is, however, stated that the English artillery did not "begin to assume a military appearance until the Flanders campaigns" of the War of the Austrian Succession. Even in the War of American Independence a dispute arose as to whether a general officer, whose regimental service had been in the Royal Artillery, was entitled to command troops of all arms, and the artillery drivers were not actually soldiers until 1793 at the earliest. French artillery officers received military rank only in 1732.

8. *Artillery in the Wars of Frederick the Great.*—By the time of Frederick the Great's first wars, artillery had thus been divided into (*a*) those guns moving with an army in the field, and (*b*) those which were either wholly stationary or were called upon only when a siege was expected. The *personnel* was gradually becoming more efficient and more amenable to discipline; the transport arrangements, however, remained in a backward state. Siege and fortress artillery was now organized and employed in accordance with the system of the "formal attack" as finally developed by Vauban. For details of this, as involving the tactical procedure of artillery in the attack and defence of fortresses, the reader is referred to FORTIFICATION AND SIEGECRAFT. We are concerned here more especially with the progress of field artillery. The part played by this arm began now to vary according to the circumstances of each action, and the "moral" support of guns was calculated as a factor in the dispositions. In the early Silesian wars, heavy or reserve guns protected the deployment of the army and endeavoured to prepare for the

subsequent advance by firing upon the hostile troops; the battalion guns remained close to the infantry, accompanied its movements and assisted in the fire fight. Their support was not without value, and the heavy guns often provoked the enemy into a premature advance, as at Mollwitz. But the infantry or the cavalry forced the decision. It has been mentioned that with the final disappearance of the pike, about 1700, infantry fire-power ruled the battlefield. Throughout the 18th century, it will be found, when the infantry is equal to its work the guns have only a subordinate part in the fighting of pitched battles. At Kunersdorf (1759) the first dashing charge of the Prussian grenadiers captured 72 guns from the Russian army. Later the total of captured ordnance reached 180, yet the Russians, then almost wholly in flight, were not cut to pieces, for only a few light guns of the Prussian army could get to the front; their heavy pieces, though twelve horses were harnessed to each, never came into action. This example will serve to illustrate the difference between the artillery of 1760 and that of fifty years later. According to Tempelhof, who was present, Kunersdorf was the finest opportunity for field artillery that he had ever seen. Yet the field artillery of the 18th century was, if anything, more powerful than that of Napoleon's time; it was the want of mobility alone which prevented the Prussians from turning to good account an opportunity fully as favourable as that of the German artillery at Sedan. That Frederick made more use of his guns in the later campaigns of the Seven Years' War is accounted for by the fact that his infantry and cavalry were no longer capable of forcing a decision, and also by changes in the general character of the operations. These were fought in and about broken country and entrenched positions, and the mobility of the other arms sank to that of the artillery. Thus power came to the front again, and the heavier weapons regained their former supremacy. In a *bataille rangée* in the open field the proportion of guns to men had been, in 1741, 2 per 1000. At Leuthen (1757) heavy fortress guns were brought to the front for a special purpose. At Kunersdorf the proportion was 4 and 5 per 1000 men, with what degree of effectiveness we have seen. In the later campaigns the Austrian artillery, which was, throughout the Seven Years' War, the best in Europe, placed its numerous and powerful ordnance (an "amphitheatre of 400 guns," as Frederick said) in long lines of field works. The combination of guns and obstacles was almost invariably too formidable to offer the slightest chance of a successful assault. It was at this stage that Frederick, in 1759, introduced horse artillery to keep pace with the movements of cavalry, a proof, if proof were needed, of the inability of the field artillery to manœuvre. The field howitzer, the weapon *par excellence* for the attack of field works, has never perhaps been more extensively employed than it was by the Prussians at that time. At Burkersdorf (1762) Frederick placed 45 howitzers in one battery. In those days the mobile artillery was always formed in groups or "batteries" of from 10 to 20 pieces. England too was certainly abreast of other countries in the organization of the field artillery arm. About the middle of the 18th century the guns in use consisted of 24-pounders, 12-pounders, 6-pounders and 3-pounders. The guns were divided into "brigades" of four, five and six guns respectively, and began to be separated into "heavy" and "light" brigades. Each field gun was drawn by four horses, the two leaders being ridden by artillerymen, and had 100 rounds of shot and 30 rounds of grape. The British artillery distinguished itself in the latter part of the Seven Years' War. Foreign critics praised its lightness, its elegance and the good quality of its materials. At Marburg (1760) "the English artillery could not have been better served; it followed the enemy with such vivacity, and maintained its fire so well, that it was impossible for the latter to re-form," says Tempelhof, the Prussian artillery officer who records the lost opportunity of Kunersdorf. The merits and the faults of the artillery had been made clear, and nowhere was the lesson taken to heart more than in France, where

General Gribeauval, a French officer who had served in the war with the Austrian artillery, initiated reforms which in the end led to the artillery triumphs of the Napoleonic era. While Frederick had endeavoured to employ, as profitably as possible, the existing heavy equipments, Gribeauval sought improvement in other directions.

9. *Gribeauval's Reforms.*—At the commencement of the 18th century, French artillery had made but little progress. The carriages and wagons were driven by wagoners on foot, and on the field of battle the guns were dragged about by ropes or remained stationary. Towards the middle of the century some improvements were made. Field guns and carriages were lightened, and the guns separated into brigades. Siege carriages were introduced. From 1765 onwards, however, Gribeauval strove to build up a complete system both of *personnel* and *matériel*, creating a distinct *matériel* for field, siege, garrison and coast artillery. Alive to the vital importance of mobility for field artillery, he dismissed to other branches all pieces of greater calibre than 12-pounders, and reduced the weight of those retained. His reforms were resisted, and for a time successfully; but in 1776 he became first inspector-general of artillery, and was able to put his ideas into force. The field artillery of the new system included 4-pounder regimental guns, and for the reserve 8- and 12-pounders, with 6-inch howitzers. For siege and garrison service Gribeauval adopted the 16-pounder and 12-pounder guns, 8-inch howitzer and 10-inch mortar, 12-, 10- and 8-inch mortars being introduced in 1785.

The carriages were constructed on a uniform model and technically improved. The horses were harnessed in pairs, instead of in file as formerly, but the manner in which the teams were driven remained much the same. The *prolong* (a sort of tow-rope) was introduced, to unite the trail of the gun and the limber in slow retiring movements. Siege carriages differed from those of field artillery only in details. Gribeauval also introduced new carriages for garrison and coast service. The great step made was in a uniform construction being adopted for all *matériel*, and in making the parts interchangeable so far as possible. In 1765 the *personnel* of the French artillery was reorganized. The corps or reserve artillery was organized in divisions of eight guns. The battery or division was thus made a unit, with guns, munitions and gunners complete, the horses and drivers being added at a later date. Horse artillery was introduced into the French army in 1791. The last step was made in 1800, when the establishment of a driver corps of soldiers put an end to the old system of horsing by contract.

10. *British Artillery, 1793-1815.*—Meanwhile the numbers of the English artillery had increased to nearly 4000 men. For some five centuries the word "artillery" in England meant entirely garrison artillery; the field artillery only existed in time of war. When war broke out, a train of artillery was organized, consisting of a certain number of field (or siege) guns, manned by garrison gunners; and when peace was proclaimed the train was disbanded, the *matériel* being returned into store, and the gunners reverting to some fort or stronghold. In 1793 the British artillery was anything but efficient. Guns were still dispersed among the infantry, mobility had declined again since the Seven Years' War, and the American war had been fought out by the other arms. The drivers were mere carters on foot with long whips, and the whole field equipment was scarcely able to break from a foot-pace. Prior to the Peninsular War, however, the exertions of an able officer, Major Spearman, had done much to bring about improvement. Horse artillery had been introduced in 1793, and the driver corps established in 1794. Battalion guns were abolished in 1802, and field "brigades of six guns" were formed, horse

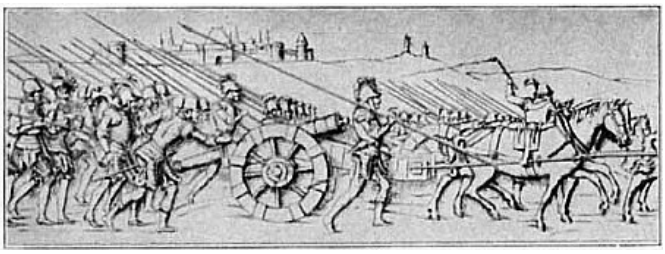
artillery batteries being styled "troops." Military drivers were introduced, and the horses teamed in pairs. The drivers were mounted on the near horses, the gunners either rode the off horses or were carried on the limbers and wagons. The equipment was lightened, and a new system of manœuvres introduced. A troop of horse artillery and a field brigade each had five guns and one howitzer. The "driver corps," raised in 1794, was divided into troops, the addition of one of which to a company of foot artillery converted it into a field brigade. The horse artillery possessed both drivers and horses, and required very limited assistance from the driver corps.

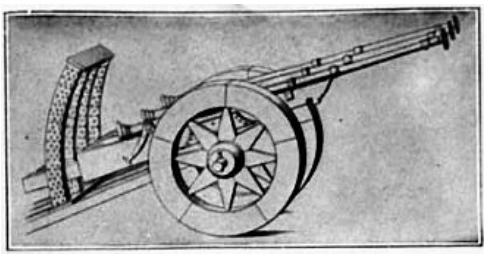
11. *French Revolutionary Wars.*—During the long wars of the French Revolution and Empire the artillery of the field army by degrees became field artillery as we know it to-day. The development of musketry in the 16th century had taken the work of preparing an assault out of the hands of the gunners. *Per contra*, the decadence of infantry fire-power in the latter part of the Seven Years' War had reinstated the artillery arm. A similar decadence of the infantry arm was destined to produce, in 1807, artillery predominance, but this time with an important difference, viz. *mobility*, and when mobility is thus achieved we have the first modern field artillery. The new tactics of the French in the Revolutionary wars, forced upon them by circumstances, involved an almost complete abandonment of the fire-tactics of Frederick's day, and the need for artillery was, from the first fight at Valmy onwards, so obvious that its moral support was demanded even in the outpost line of the new French armies. St Cyr (*Armies of the Rhine*, p. 112) quotes a case in which "right in the very farthest outpost line" the original 4-pounder guns were replaced by 8-, 16-, and in the end by 24-pounders. The cardinal principle of massing batteries was not, indeed, forgotten, notwithstanding the weakness of raw levies. But though, as we have seen, the *matériel* had already been greatly improved, and the artillery was less affected by the Revolution than other arms of the service, circumstances were against it, and we rarely find examples of artillery work in the Revolutionary wars which show any great improvement upon older methods. The field guns were however, at last organized in batteries each complete in itself, as mentioned above. The battalion gun disappeared; it was a relic of days in which it was thought advisable, both for other reasons and also because the short range of guns forbade any attempt at concentration of fire from several positions at one target, to have some force of artillery at any point that might be threatened. Though it was officially retained in the regulations of the French army, "officers and men combined to reject it" (Rouquerol, *Q. F. Field Artillery*, p. 121), and its last appearances, in 1809 and in 1813, were due merely to an endeavour on the part of Napoleon to give cohesion thereby to the battalions of raw soldiers which then constituted his army. But, with the development of mobility, it was probably found that sufficient guns could be taken to any threatened point, and no one had ever denied the principle of massed batteries, although, in practice, dispersion had been thought to be unavoidable.

12. *Napoleon's Artillery Tactics.*—During the war the French artillery steadily improved in manoeuvring power. But many years elapsed before perfection was attained. Meanwhile, the infantry, handled without regard to losses in every fight, had in consequence deteriorated. The final production of the field artillery battle, usually dated as from the battle of Friedland (June 14, 1807), therefore saved the situation for the French. Henceforward Napoleon's battles depend for their success on an "artillery preparation," the like of which had never been seen. Napoleon's own maxim illustrates the typical tactics of 1807-1815. "When once the *melée* has begun," he says, "the man who is clever enough to bring up an unexpected force of artillery, without the enemy knowing it, is sure to carry the day." The

guns no longer "prepared" the infantry advance by slowly disintegrating the hostile forces. Still less was it their business merely to cover a deployment. On the contrary, they now went in to the closest ranges and, by actually *annihilating* a portion of the enemy's line with case-shot fire, "covered" the assault so effectively that columns of cavalry and infantry reached the gap thus created without striking a blow. It is unnecessary to give examples. Every one of Napoleon's later battles illustrates the principle. The most famous case is that of the great battery of 100 guns at Wagram (*q.v.*) which preceded the final attack of the centre. When Napoleon at Leipzig saw the allied guns forming up in long lines to prepare the assault, he exclaimed, "At last they have learned something." This "case-shot preparation," of course, involved a high degree of efficiency in manœuvre, as the guns had to gallop forward far in front of the infantry. The want of this quality had retarded the development of field artillery for 300 years, during which it had only been important relatively to the occasional inferiority of other troops. After Napoleon's time the art of tactics became the art of *combining the three arms*.

PLATE I.





FIGS. 1 and 2.—15th Century Field Artillery (Napoleon III).

FIG. 3.—Field Artillery. 1525 (Napoleon III).

FIG. 4.—French Artillery 1735 (*Journal d'Armée*,1835).

FIG. 5.—French Field Artillery,1835 (*Journal d'Armée*,1835).

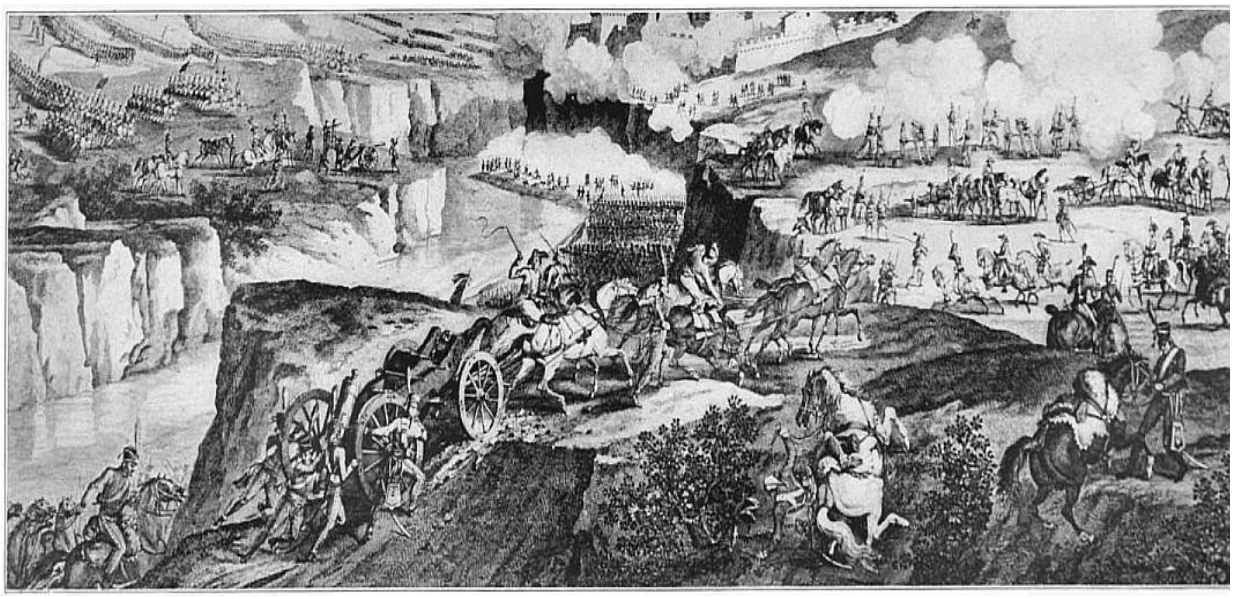
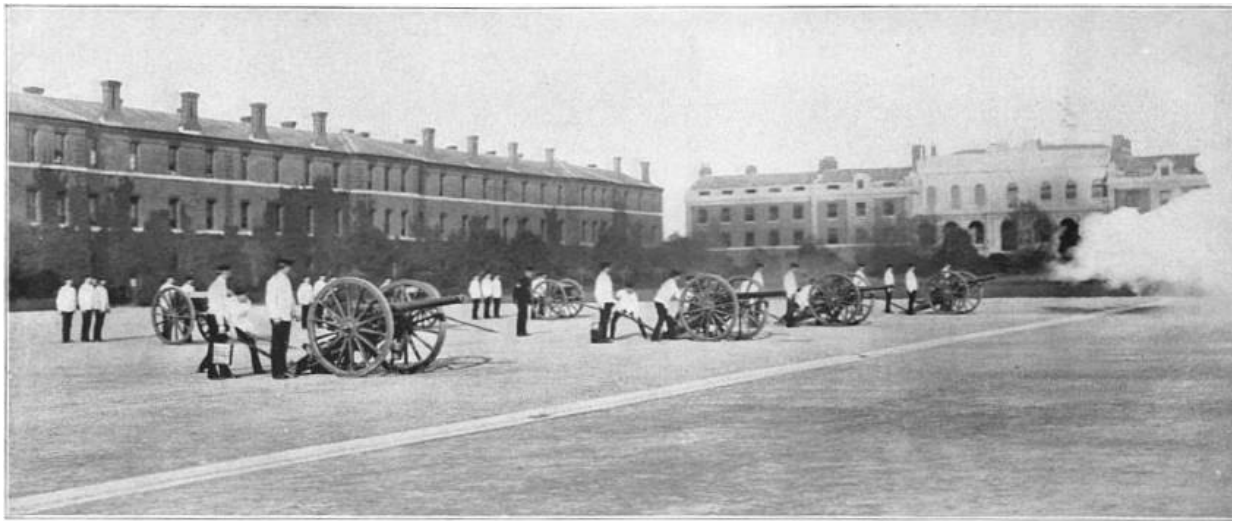


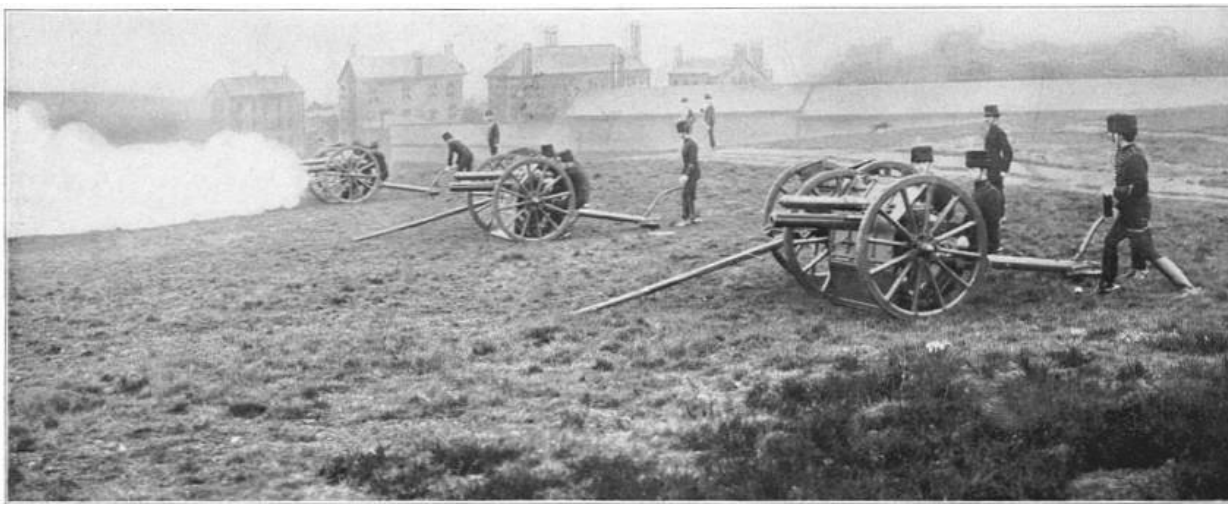
FIG. 6.—Artillery in Action, Roveredo, 1796 (C. Vernet).

PLATE II.



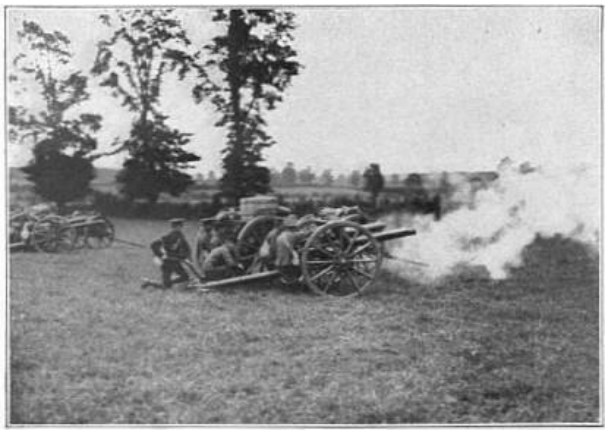
Photo, Gale & Polden.

BREACH LOADING FIELD BATTERY (15-Pr. B.L.).



Photo, Gale & Polden.

QUICK-FIRING HORSE ARTILLERY (ROYAL HORSE ARTILLERY, 13-Pr. Q.F.).



Photo, Gale & Polden.
Q.F. FIELD ARTILLERY (18-Pr. Q.F., R.F.A.).

Photo, Topical Press.
FRENCH (75-Mm. Q.F.) FIELD ARTILLERY MANOEUVRING.

13. *Artillery, 1815-1865.*—Henceforward, therefore, the history of artillery becomes the history of its technical effectiveness, particularly in relation to infantry fire, and of improvements or modifications in the method of putting well-recognized principles into action. Infantry fire, however, being more variable in its effectiveness than that of artillery, the period 1815-1870 saw many changes in the relations of the two arms. In the time of Napoleon, infantry fire never equalled that of the Seven Years' War, and after the period of the great wars the musket was less and less effectively used. Economy was, however, practised to excess in every army of Europe during the period 1815-1850, and even if there had been great battles at this time, the artillery, which was maintained on a minimum strength of guns, men and horses, would not have repeated the exploits of Sénarmont and Drouot in the Napoleonic wars. The principle was well understood, but under such conditions the practice was impossible. It was at this stage that the general introduction of the rifled musket put an end, once for all, to the artillery tactics of the smooth-bore days. Infantry, armed with a far-ranging rifle, as in the American Civil War, kept the guns beyond case-shot range, compelling them to use only round shot or common shell. In that war, therefore, attacking infantry met, on reaching close quarters, not regiments already broken by a *feu d'enfer*, but the full force of the defenders' artillery and infantry, both arms fresh and unshaken, and the full volume of their case shot and musketry. At Fredericksburg the Federal infantry attacked, unsupported by a single field piece; at Gettysburg the Federal artillery general Hunt was able to reserve his ammunition to meet Lee's assault, although the infantry of his own side was meanwhile subjected to the fire of 137 Confederate guns. Thus, in both these cases the assault became one of infantry against unshaken infantry and artillery. On many occasions, indeed, the batteries on either side went into close ranges, as the traditions of the old United States army dictated, but their losses were then totally out of proportion to their effectiveness. Indeed, the increased range at which battles were now fought, and the ineffectiveness of the projectiles necessarily used by the artillery at these ranges, so far neutralized even rifled guns that artillery generals could speak of "idle cannonades" as the "besetting sin" of some commanders.

14. *The Franco-German War, 1870-71.*—In the next great war, that of 1866 (Bohemia), guns were present on both sides in great numbers, the average for both sides being three guns per 1000 men.

Artillery, however, played but a small part in the Prussian attacks, this being due to the inadequate training then afforded, and also to the mixture of rifled guns and smooth-bores in their armament. In Prussia, however, the exertions of General v. Hindersin, the improvement of the *matériel*, and above all the better tactical training of the batteries, were rewarded four years later by success on the battlefield almost as decisive as Napoleon's. In 1870 the French artillery was invariably defeated by that of the Germans, who were then free to turn their attention to the hostile infantry. At first, indeed, the German infantry was too impatient to wait until the victorious artillery had prepared the way for them by disintegrating the opposing line of riflemen. Thus the attack of the Prussian Guards at St Privat (August 18, 1870) melted away before the unbroken fire-power of the French, as had that of the Federals at Fredericksburg and that of the Confederates at Gettysburg. But such experiences taught the German infantry commanders the necessity of patience, and at Sedan the French army was enveloped by the fire of nearly 600 guns, which did their work so thoroughly that the Germans annihilated the Imperial army at the cost of only 5% of casualties.

15. *Results of the War.*—The tactical lessons of the war, so far as field artillery is concerned, may be briefly summarized as (*a*) employment of great masses of guns; (*b*) forward position of guns in the order of march, in order to bring them into action as quickly as possible; (*c*) the so-called "artillery duel," in which the assailant subdues the enemy's artillery fire; and (*d*) when this is achieved, and not before, the thorough preparation of all infantry attacks by artillery bombardment. This theory of field artillery action has not, even with the almost revolutionary improvements of the present period, entirely lost its value, and it may be studied in detail in the well-known work of von Schell, *Taktik der Feldartillerie* (1877), later translated into English by Major-General Sir A.E. Turner (*Tactics of Field Artillery*, 1900). In one important matter, however, the precepts of Schell and his contemporaries no longer hold good. "It is absolutely necessary that the object of the infantry's attack should be cannonaded before it advances. To accomplish this, sufficient time should be given to the artillery, and on no account should the infantry be ordered to advance until the fire of the guns has produced the desired effect." This, the direct outcome of the slaughter at St Privat, represents the best possibilities of breech-loading guns with common shell—no more than a slow disintegration of the enemy's power of resistance by a thorough and lengthy "artillery preparation." Against troops sheltered behind works (as in the Russo-Turkish War of 1877-78) the common shell usually failed to give satisfactory results, if for no other reason, because the "preparation" consumed an inordinate time, and in any case the hostile artillery had first of all to be subdued in the artillery duel.

16. *Quick-firing Field Guns.*—In 1891, a work by General Wille of the German army (*The Field Gun of the Future*) and in 1892 another by Colonel Langlois of the French service (*Field Artillery with the other Arms*) foreshadowed many revolutionary changes in *matériel* and tactics which have now taken place. The new ideas spread rapidly, and the quick-firing gun came by degrees to be used in every army. The original designs have been greatly improved upon (see ORDNANCE: *Field artillery equipments*), but the principles of these designs have not undergone serious modification. These are, briefly, the mechanical absorption of the recoil, by means of brakes or buffers, and the development of "time shrapnel" as the projectile of field artillery. The absorption of recoil of itself permits of a higher rate of fire, since the gun does not require to be run up and relaid after every shot. Formerly such an advantage was illusory (since aim could not be taken through the thick bank of smoke produced by rapid fire), but

the introduction of smokeless powder removed this objection. Artillerists, no longer handicapped, at once turned their attention to the increase of the rate of fire. At the same time a shield was applied to the gun, for the protection of the detachment. This advantage is solely the result of the non-recoiling carriage. The gunners had formerly to stand clear of the recoiling gun, and a shield was therefore of but slight value.

17. *Time Shrapnel.*—The power of modern artillery owes even more to the improvement of the projectile than to that of the gun (see AMMUNITION). The French, always in the forefront of artillery progress, were the first nation to realize the new significance of the time-fuze and the shrapnel shell. These had been in existence for many years; to the British army are due both the invention and the development of the shrapnel, which made its first appearance in European warfare at Vimeira in 1808. But, up to the introduction of rifled pieces, the Napoleonic case-shot attack was universally and justly considered the best method of fighting, and in the transition stage of the *matériel* many soldiers continued to put faith in the old method,—hence the Prussian artillery in 1866 had many smooth-bore batteries in the field,—and between 1860 and 1870 gunners, now convinced of the superiority of the new equipments, undoubtedly sought to turn to account the minute accuracy of the rifled weapons in unnecessarily fine shooting. Thus, in 1870 the French time-fuze was only graduated for two ranges, and the Germans used percussion fuzes only. But this phase has passed, and General Langlois has summarized the tactics of the newest field artillery in one phrase: "It results in transferring to 3000 yds. the point-blank and case-shot fire of the smooth-bore." The meaning of this will be discussed later; here it will be sufficient to say that it is claimed for the modern gun and the modern shell that the Napoleonic method[1] of annihilating by a rain of bullets has been revived, with the distinction that the shell, and not the gun, fires the bullets close up to the enemy. In the Boer War, Pieter's Hill furnished a notable example of this "covering," as distinct from "preparation," of an assault by artillery fire.

18. *Heavy Field, Siege and Garrison Artillery.*—Amongst other results of this war was a recrudescence of the idea of "dispersion." This will be noticed later; the more material result of the Boer War, and of the generally increasing specialization in the various functions of the artillery arm, has been the reintroduction of heavy ordnance into field armies. The field howitzer reappeared some time before the outbreak of that war, and the British howitzers had illustrated their shell-power in the Sudan campaign of 1898. During the latter part of the 19th century, siege and fortress artillery underwent a development hardly less remarkable than that of field artillery in the same time. Rifled guns, "long" and "short" for direct and curved fire, formed the siege artillery of the Germans in 1870-71, and with the reduction of the old-fashioned fortresses of France began a new era in siegecraft (see FORTIFICATION AND SIEGECRAFT). At the present time howitzers[2] (B.L. rifled) are the principal siege weapons, while heavy direct-fire guns (see ORDNANCE *passim*) still retain a part of the work formerly assigned to the artillery of the attack. For an account of a siege with modern artillery see Macalik and Länger, *Kampf um eine Festung*, which describes an imaginary siege of Königgrätz. On the whole, it may be said that modern artillery has caused a revolution in methods of fortification and siegecraft, which is little less far-reaching than the original change from the trébuchet to the bombard.

ORGANIZATION

19. *Field Artillery Organization.*—A *battery* of field artillery comprises three elements, viz. *matériel*, —guns, carriages, ammunition and stores; *personnel*,—officers, non-commissioned officers, gunners, drivers and artificers; and *transport*,—almost invariably horses, though other animals, and also motor and mechanical transport, are used under special circumstances. As for the *matériel*, the guns used by field artillery in almost all countries are quick-firers, throwing shells of 13 to 18 pounds; details of these will be found in the article ORDNANCE. The number of guns in a battery varies in different countries between four and eight; by far the most usual number is six. With the introduction of the quick-firing gun, the tendency towards small batteries (of four guns) has become very pronounced, the ruling motives being (*a*) better control of fire in action, and (*b*) more horses available to draw the increased number of ammunition wagons required. "Mixed" batteries of guns and howitzers were formerly employed on occasion, and were supposed to be adapted to every kind of work. However, the difference between the gun and the howitzer was so great that at all times one part of the armament was idle, while the general increase in the artillery arm has permitted batteries and brigades of howitzers to be formed, separately, as required. Machine guns (*q.v.*) are not treated in Great Britain as being artillery weapons, though abroad they are often organized in batteries. During, and subsequent to the Boer War, heavier machine guns, called pompoms, came into use. The rocket (*q.v.*), formerly a common weapon of the artillery, is now used, if at all, only for mountain and forest warfare against savages.

20. *Ammunition.*—The vehicles of a battery include (besides guns and limbers) ammunition wagons, store and provision carts or wagons and forage wagons. On the amount of ammunition that should be carried with a field battery there was formerly a considerable diversity of opinion. The greater the amount a battery carries with it, the more independent it is; on the other hand, every additional wagon makes the battery more cumbrous and, by lengthening out the column, keeps back the combatant troops marching in rear. But since the introduction of the Q.F. gun it has been universally recognized that the gun must have a very liberal supply of ammunition present with it in action, and the old standard allowance of one wagon per gun has been increased to that of two and even three. Formerly batteries were further hampered by having to carry the reserve of small-arm ammunition for infantry and cavalry. But the greater distances of modern warfare accentuate the difficulties of such a system, and the reserve ammunition for all arms is now carried in special "ammunition columns" (see AMMUNITION), the *personnel* and transport of which is furnished by the artillery.

21. *Interior Economy.*—The organization and interior economy of a battery is much the same in all field artillery. In England the command is held by a major, the second in command is a captain. The battery is divided into three "sections" of two guns each, each under a subaltern officer, who is responsible for everything connected with his section—men, horses, guns, carriages, ammunition and stores. Each section again consists of two sub-sections, each comprising one gun and its wagons, men and horses, and at the head of each is the "No. 1" of the gun detachment—usually a sergeant—who is immediately responsible to the section commander for his sub-section.

The No. 1 rides with the gun, there is also another mounted non-commissioned officer who rides with the first wagon, and the gunners are seated on the gun-carriage, wagon and limbers. The increased number of wagons now accompanying the gun has, however, given more seating accommodation to the detachment, and this distribution has in some cases been altered. The three drivers ride the near horses

of their respective pairs, each gun and each wagon being drawn by six horses. On the march, the gun is attached to the limber, a two-wheeled carriage drawn by the gun team; the wagon consists likewise of a "body" and a limber. A battery has also a number of non-combatant carriages, such as forge and baggage wagons. In addition to the gunners and drivers, there are men specially trained in range-taking, signalling, &c., in all batteries.

22. *Special Natures of Field Artillery.—Horse Artillery* differs from field in that the whole gun detachment is mounted, and the gun and wagon therefore are freed from the load of men and their equipment. The organization of a battery of horse artillery differs but slightly from that of a field battery; it is somewhat stronger in rank and file, as horse-holders have to be provided for the gunners in action. Horse artillery is often lightened, moreover, by sacrificing power (see ORDNANCE). The essential feature of *Mountain Artillery* in general is the carrying of the whole equipment on the backs of mules or other animals. The total weight is usually distributed in four or five mule-loads. For action the loads are lifted off the saddles and "assembled," and the time required to do this is, in well-trained batteries, only one minute. For the technical questions connected with the gun and its carriage, see ORDNANCE. The weight of a shell in a mountain gun rarely exceeds 12 ℔, and is usually less. In most armies the *field howitzer* has, after an eclipse of many years, reasserted its place. The weapons used are B.L. or Q.F. howitzers on field carriages; the calibre varies from about 4 to 5 in. In Great Britain the field howitzer batteries are organized as, and form part of, the Royal Field Artillery, two batteries of six howitzers each forming a brigade.

23. *Heavy Ordnance.—Heavy Field Artillery*, officially defined as "all artillery equipped with mobile guns of 4-in. calibre and upwards," is usually composed, in Great Britain, of 5-in. or 4.7-in. Q.F. guns on field carriages. 6-in. Q.F. guns have also been used. A battery (4 guns) is attached to the divisional artillery of each division, a company of the Royal Garrison Artillery furnishing the *personnel*. The four guns are divided into two sections, each section under an officer and each subsection under a non-commissioned officer, as in the horse and field batteries. *Siege* and *garrison artillery* have not usually the complete and permanent organization that distinguishes field artillery. For siege trains the *matériel* is usually kept in store, and the *personnel* and transport are supplied from other sources according to requirement. In garrison artillery, the guns mounted in fortresses and batteries, or stored in arsenals for the purpose, furnish the *matériel*, and the companies of garrison artillery the *personnel*. In Great Britain, the Royal Garrison Artillery finds the mountain batteries and the heavy field artillery in addition to its own units. The siege trains are, as has been said, organized *ad hoc* on each particular occasion (see FORTIFICATION AND SIEGECRAFT). In Great Britain, the guns and howitzers manned by the R.G.A. would be 6-in. and 8-in. howitzers, 4.7-in. and 6-in. guns, and still heavier howitzers, as well as the field and heavy batteries belonging to the divisions making the siege.

24. *Higher Organization of Artillery.*—The higher units, in almost every country except Great Britain, are the regiment, and, sometimes, the brigade of two or more regiments. These units are distributed to army corps, divisions and districts, in the same way as units of other arms (see ARMY). In Great Britain the Royal Regiment of Artillery still comprises the whole *personnel* of the arm, being divided into the Royal Horse, Royal Field and Royal Garrison Artillery; to each branch Special Reserve and Territorial artillery are affiliated. Over and above the military command of these higher units, provision is usually

made for technical control of the *matériel*, and a variety of training and experimental establishments, such as schools of gunnery, are maintained in all countries. The more special unit of organization in mobile artillery is the *brigade*, formerly called brigade-division (German, *Abteilung*; French *groupe*). The brigade is in Great Britain the administrative and tactical unit. Mountain artillery is not organized in brigades in the British empire. The unit consists, in the case of guns, of three batteries (18 guns, heavy artillery 12), in the case of field howitzers of two batteries (12 howitzers), and in the horse artillery of two batteries (12 guns), and is commanded by a lieutenant-colonel. To each brigade is allotted an ammunition column. The necessity for such a grouping of batteries will be apparent if the reader notes that 54 field guns, 12 howitzers and 4 heavy field guns form the artillery of a single British division of about 15,000 combatants.

25. *Grouping of the Artillery.*—The "corps artillery" (formerly the "reserve artillery") now consists only of the howitzer and heavy brigades, with a brigade of horse artillery. The latter is held at the disposal of the corps commander for the swift reinforcement of a threatened point; the howitzers and the heavy guns have, of course, functions widely different from those of the mass of guns. As the field artillery is required to come into action at the earliest possible moment, it has now been distributed amongst the infantry divisions, and marches almost at the head of the various combatant columns, instead of being relegated perhaps to the tail of the centre column. The redistribution of the British army (1907) on a divisional basis is a remarkable example of this; even the special natures of artillery (except horse artillery) are distributed amongst the divisions. In Germany two "regiments" (each of 2 *Abteilungen* = 6 batteries) form a brigade, under an artillery general in each division who thus disposes of 72 field guns, and the howitzers, with such horse artillery batteries as remain over after the cavalry has been supplied, still form a corps or reserve artillery. In 1903 the French, after long hesitation, assigned the whole of the field artillery to the various divisions, but later (for reasons stated in the article TACTICS) arranged to reconstitute the old-fashioned corps artillery in war. (See also ARMY, § 49).

TACTICAL WORK

26. *General Characteristics of Field Artillery Action.*—The duty of field artillery in action is to fire with the greatest effect on the target which is for the moment of the greatest tactical importance. This definition of field artillery tactics brings the student at once to questions of combined tactics, for which consult the article TACTICS. The purpose of the present article is to indicate the methods employed by the gunners to give effect to their fire at the targets mentioned. For this purpose the artillery has at its disposal two types of projectile, common (or rather, high explosive) shell and shrapnel, and two fuzes, "time" and "percussion" (see AMMUNITION). The actual process of coming into action may be described in a few words. The gun is, at or near its position in action, "unlimbered" and the gun limber and team sent back under cover. Ammunition for the gun is first taken from the wagon that accompanies it, as it is very desirable to keep the limbers full as long as possible, in case of emergencies such as that of a temporary separation from the wagon. Limber supply is, however, allowed in certain circumstances. The wagon is now placed as a rule by the side of the gun, an arrangement which immensely simplifies the supply of ammunition, this being done under cover of the armour on the wagon and of the gun-shield and also without fatigue to the men. The older method of placing the wagon at some distance behind the

gun is still occasionally used, especially in the case of unshielded equipments. No horses are allowed, in any case, to be actually with the line of guns. According to the British *Field Artillery Training* of 1906, a battery in action would be thus distributed: first, the "fighting battery" consisting of the six guns, each with its wagon alongside, and the limbers of the two flank guns; then, under cover in rear, the "first line of wagons" comprising the teams of the fighting battery, the four remaining gun limbers, and six more wagons. The non-combatant vehicles form the "second line of wagons."

27. *Occupation of a Position.*—This depends primarily upon considerations of tactics, for the accurate co-operation of the guns is the first essential to success in the general task. In details, however, the choice of position varies to some extent with the nature of the equipment: for instance, an elevated position is better adapted than a low one for high velocity guns firing over the heads of their own infantry, and again, the "spade" with which nearly all equipments are furnished (see ORDNANCE) should have soil in which it can find a hold. Cover for the gun and its detachment cannot well be obtained from the configuration of the ground, because, if the gun can shoot over the covering mass of earth, the hostile shells can of course do likewise. Sufficient protection is given by the shield, and thus "cover" for field-guns simply means concealment. Cover for the "first line of wagons" is, however, a very serious consideration. As to concealment, it is stated that "the broad white flash from a gun firing smokeless powder is visible" to an enemy "unless the muzzle is at least 10 ft. below the covering crest" (Bethell, *Modern Guns and Gunnery*, 1907, p. 147). Concealment therefore, means only the skilful use of ground in such a way as to make the enemy's ranging difficult. This frequently involves the use of retired positions, on reverse slopes, in low ground, &c., and in all modern artillery the greatest stress is laid on practice in firing by indirect means. Controversy has, however, arisen as to whether inability to see the foreground is not a drawback so serious that direct fire from a crest position, in spite of its exposure, must be taken as the normal method. The latter is of course immensely facilitated by the introduction of the shield. A great advantage of retired positions is that, provided unity of direction is kept, an overwhelming artillery surprise (see *F. A. Training*, 1906, p. 225) is carried out more easily than from a visible position. The extent of *front* of a battery in action is governed by the rule that no two gun detachments should be exposed to being hit by the bullets of one shell, and also by the necessity of having as many guns as possible at work. These two conditions are met by the adoption of a 20-yards interval between the muzzles of the guns. At the present time the gun and its wagon are placed as close together as possible, to obtain the full advantage of the armoured equipment. The *shield*, behind which the detachments remain at all times covered from rifle (except at very short range) and shrapnel bullets,[3] enables the artillery commander to handle his batteries far more boldly than formerly was the case. General Langlois says "the shield-protected carriage is the corollary to the quick-firing gun." Armour on the wagon, enabling ammunition supply as well as the service of the gun, to be carried on under cover, soon followed the introduction of the shield. The disadvantage of extra weight and consequently increased difficulty of "man-handling" the equipment is held to be of far less importance than the advantages obtained by the use of armour.

28. *Laying.*—"Elevation" may be defined as the vertical inclination of the gun, "direction" as the horizontal inclination to the right or left, necessary to direct the path of the projectile to the object aimed at. "Laying" the gun, in the case of most modern equipments, is divided, by means of the device called the independent line of sight (see ORDNANCE), into two processes, performed simultaneously by

different men, the adjustment of the sights and that of the gun. The first is the act of finding the "line of sight," or line joining the sights and the point aimed at; for this the equipment has to be "traversed" right or left so as to point in the proper direction, and also adjusted in the vertical plane. The simplest form of laying for direction, or "line," is called the "direct" method. If the point aimed at is the target, and it can be seen by the layer, he has merely to look over the "open" sights. But the point aimed at is rarely the target itself. In war, the target, even if visible, is often indistinct, and in this case, as also when the guns are under cover or engaging a target under cover, an "aiming point" or "auxiliary mark," a conspicuous point quite apart and distinct from the target, has to be employed ("indirect" method). In the Russo-Japanese War the sun was sometimes used as an aiming point. When the guns are behind cover and the foreground cannot be seen, an artificial aiming point is often made by placing a line of "aiming posts" in the ground. If an aiming point can be found which is in line with the target, as would be the case when aiming posts are laid out, the laying is simple, but it is as often as not out of the line. Finding the "line" in this case involves the calculation, from a distant observing point, of the angle at which the guns must be laid in order that, when the sights are directed upon the aiming point, the shell will strike the target. It is further necessary to find the "angle of sight" or inclination of the line of sight to the horizontal plane. If aim be taken over the open sights at the target, the line of sight naturally passes through the target, but in any other case it may be above or below it. Then the point where the projectile will meet the line of sight, which should coincide with the target, is beyond it if the line of sight is below or angle of sight is too small, and short of it if the line of sight is too high—that is, range and fuze will be wrong. The process of indirect laying for elevation therefore is, first, the measurement of the angle of sight, and secondly, the setting of the sights to that angle by means of a clinometer; this is called clinometer laying. In all cases the actual elevation of the gun to enable the shell to strike the target is a purely mechanical adjustment, performed independently; the gun is moved relatively to the sights, which have been previously set as described. Frequently the battery commander directs the guns from a point at some distance, communication being maintained by signallers or by field telephone. This is the normal procedure when the guns are firing from cover. Instruments of precision and careful calculations are, of course, required to fight a battery in this manner, many allowances having to be made for the differences in height, distance and angle between the position of the battery commander and that of the guns.

29. *Ranging*[4] (except on the French system alluded to below) is, first, finding the range (*i.e.* elevation required), and secondly, correcting the standard length of fuze for that range in accordance with the circumstances of each case. To find the elevation required, it is necessary to observe the bursts of shells "on graze" with reference to the target. The battery commander orders two elevations differing by 300 yds., *e.g.* "2500, 2800," and tells off a "ranging section" of two guns. These proceed to fire percussion shrapnel at the two different elevations, in order to obtain bursts "over" (+) and "short" (−). When it is certain that this "long bracket" is obtained, the "100 yds. bracket" is found, the elevations in the given case being, perhaps, 2600 and 2700 yds. "Verifying" rounds are then fired, to make certain of the 100 yds. bracket. The old "short bracket" (50 yds.) is not now required except at standing targets. Circumstances may, of course, shorten the process; for instance, a hit upon the target itself could be "verified" at once. The determination of the fuze (by time shrapnel) follows. The fuze has a standard length for the ascertained range, but the proper correction of this standard length to suit the atmospheric conditions has to be made. The commander has therefore already given out a series of corrector[5] lengths,

his object being to secure bursts both in air and on graze. When he is finally satisfied he opens fire "for effect."

30. An example of the ordinary method of ranging, adapted from *Field Artillery Training*, 1906, is given below.

Battery commander gives target, &c., and orders: "Right section ranging section; remainder corrector 150 increase 10, 4400-4700," for the long bracket.

No. 1 gun fires, elevation 4400 yds., P.S., round observed −
No. 2 gun fires, elevation 4700 yds., P.S., round observed +

B.C. orders "4500-4600."

No. 1 gun fires, elevation 4500 yds., P.S., round observed −
No. 2 gun fires, elevation 4600 yds., P.S., round observed +

The 100 yds. bracket appears to be 4500-4600. B.C. orders: "Remainder 4500 time shrapnel," and gives the ranging section 4500-4600 to "verify." Guns 3, 4, 5, 6 set fuzes for 4500 with correctors 150, 160, 170, 180.

No. 1 gun fires, elevation 4500 yds., P.S., round observed −
No. 2 gun fires, elevation 4600 yds., P.S., round observed +

B.C. orders: "Remainder 4500, one round gun fire, 3 seconds."

No. 3 elevation 4500 yds. T.S. corrector 150 air
No. 4 elevation 4500 yds. T.S. corrector 160 air
No. 5 elevation 4500 yds. T.S. corrector 160 graze
No. 6 elevation 4500 yds. T.S. corrector 180 graze

B.C. selects corrector 160 and goes to "section fire."

The battery now begins to fire "for effect."

No. 1 elevation 4500 yds. T.S. corrector 160 air
No. 3 elevation 4500 yds. T.S. corrector 160 air

followed by Nos. 5, 2, 4 and 6.

There is another method of ranging, viz. with time shrapnel only. In this the principle is that several shells, fired with the same corrector setting, but at different elevations, will burst in air at different points along one line. Bursts high in the air cannot be judged, and it is therefore necessary to bring down the line of bursts to the target, so that the bursts in air appear directly in front or directly in rear of it. Rounds are therefore fired (in pairs owing to possible imperfections in the fuzes) to ascertain the corrector which gives the best line of observation. This found, the target is bracketed by bursts low in the air observed + and −, as in the ordinary method with percussion shrapnel.

The operations of finding the "line of fire" and the proper elevation may be combined, as the shells in ranging can be made to "bracket" for direction as well as for elevation. The line can be changed towards a new target in any kind of direct and indirect laying, in the latter case by observing the angle made with it by the original line of fire and giving deflection to the guns accordingly. Further, the fire of several dispersed batteries may be concentrated, distributed, or "switched" from one target to another on a wide front, at the will of the commander.

31. *Observation of Fire*, on the accuracy of which depends the success of ranging, may be done either by the battery commander himself or by a special "observing" party. In either case the shooting is carefully observed throughout, and corrections ordered at any time, whether during the process of ranging or during fire for effect. The difficulties of observation vary considerably with the ground, &c., for instance, the light may be so bad that the target can hardly be seen, or again, if there be a hollow in front of the target, a shell may burst in it so far below that the smoke appears thin, the round being then judged "over" instead of "short." On the other hand, a hollow behind the target may cause a round to be lost altogether. Ranging with time shrapnel has the merit of avoiding most of these "traps." The "French system of fire discipline," referred to below, has this method as the usual procedure.

32. *Fire.*—Field Artillery ranges are classed in the British service as: "distant," 6000 to 4500 yds.; "long," 4500 to 3500; "effective," 3500 to 2000: and "decisive," 2000 and under. The actual methods of fire employed are matters of detail; it will be sufficient to say that "section fire," in which the two guns of a section are fired alternately at a named interval, usually 30 seconds, and "rapid fire," in which two, three or more rounds as ordered are fired by each gun as quickly as possible, are the normal methods. Each battery usually engages a portion of the objective equal in length to its own front, owing to the spread of the cone of shrapnel bullets (see below). The fire is, of course, almost always frontal, though enfilade and oblique fire, when opportunities occur for their employment, are more deadly than ever, because of the depth of the cone. As for the general conduct of an artillery action, accurate fire for effect, at a medium rate, is used in most armies, but in the French and, since 1906, in the British services a new method has arisen, in consequence of the introduction of the modern quick-firer and the perfection of the time shrapnel. The French battery (1900 Q.F. equipment) consists of four guns and twelve wagons. The gun is shielded, as also are the wagons; the high velocity and flat trajectory give a maximum depth to the cone of shrapnel bullets. In the hope of obtaining a rapid and overwhelming fire, the French artillery ranges only for a long bracket, and once this bracket is found, the ground within its limits is swept from end to end in a burst of rapid fire. This is termed a *rafale* (squall or gust), and technically signifies "a series of eight rounds per gun, each two rounds being laid with 100 metres more elevation than the last pair, the whole fired off as rapidly as possible." The cone of time shrapnel being assumed as 300 yds. (or metres), it is clear that four pairs of rounds, bursting, say, at 1000, 1100, 1200 and 1300 yds. (adding, for the last, 300 yds. for its forward effect), sweep the whole ground between 1000 and 1600 yds. from the guns. The maximum depth would, of course, be obtained with four elevations differing by the depth of the cone; in such a case the space from 1000 to 2200 yds. would be covered, though much less effectively, since the same number of bullets are distributed over a larger area. On the other hand, the *rafale*, at a minimum, covers 300 yds., all the guns in this case being laid at the same elevation throughout. Here the maximum number of bullets is obtained for every square yard attacked. Between these extremes, a skilful artillery officer can vary the *rafale* to the needs of each several case almost

indefinitely. “Sweeping” fire is a series of three rounds per gun, one in the original line, one to the right and one to the left of it; this is significantly called “mowing” (*tir fauchant*). A further refinement in both services is the combined “search and sweep.” Forty-eight rounds, constituting in the French army a series of this last kind, can, it is said, be fired in 1 minute and 15 seconds, without setting fuzes beforehand, to cover an area of 600 × 200 metres. The result of such a series, worked out mathematically, is that 19% of all men and 75% of all horses, in the area and not under cover, should be hit by separate bullets (Bethell, *Modern Guns and Gunnery*, 1907). Even allowing a liberal deduction for imperfect distribution of bullets, we may feel certain that nothing but shielded guns could live long in the fire-swept zone. This is, of course, a rate of fire which could not be kept up for any length of time by the same battery. A French battery, firing at the maximum rate, would expend every available round in 13 minutes.

33. *Projectiles Employed.*—“Time shrapnel,” say the German Field Artillery regulations, “is the projectile *par excellence* ... against all animate targets which are not under cover.” It achieves its purpose, as has been said, by sending a shower of bullets over an area of ground in such quantity that this is swept from end to end. These bullets are propelled, in a cone, forward from the point of burst of the shell, and the effective depth of this cone at medium ranges with a fairly high velocity gun may be taken at 300 yds. Further, the corrector enables the artillery commander to burst his shells at any desired point; for example, a long fuze may be given, to burst them close up when firing upon a deep target (such as troops in several lines, one behind the other), and thereby to obtain the maximum searching effect, or to obtain direct hits on shielded guns, while a short corrector, bursting the shell well in front of the enemy, allows the maximum lateral spread of the bullets, and therefore sweeps the greatest front. The number of bullets in the shell is such that troops in the open under effective shrapnel fire must suffer very heavily, and may be almost annihilated. If the enemy is close behind good cover, the bullets, indeed, pass harmlessly overhead. This, however, leads to a very important fact, viz. that artillery can keep down the fire of hostile infantry, “blind” the enemy, in Langlois’ phrase, by *pinning it down* to cover. Under cover the men are safe, but if they raise their heads to take careful aim, they will almost certainly be hit. Their fire under such conditions is therefore unaimed and wild at the best, and may be wholly ineffective. *Common* shell and *high-explosive* shell (see AMMUNITION) belong to another class of projectile. The former is now not often used, but a certain proportion of H.E. shell is carried by the field artillery in many armies (see table in ORDNANCE: *Field Equipments*). This has a very violent local effect within a radius of 20 to 25 yds. of the point of burst (see AMMUNITION, fig. 10). It therefore covers far less ground than shrapnel, and is naturally used either (*a*) against troops under substantial cover or (*b*) to wreck cover and buildings. In the former case the shell is supposed to send a rain of splinters vertically downwards. This it will do, provided the fuze is minutely accurate, and a burst is thus obtained exactly over the heads of the enemy, but this is now generally held to be unlikely, and in so far as effect against *personnel* is concerned the H.E. shell is not thought to be of much value. Indeed, in the British and several other services, no H.E. shells at all are carried by field batteries, reliance being placed upon percussion shrapnel in attacking localities, buildings, &c., and for ranging. Experiments have been made towards producing a “H.E. shrapnel,” which combines the characteristics of both types (see, for a description, AMMUNITION). For the projectiles used in attacking shielded guns, see section on “field howitzers” below. *Case shot* is now rarely employed. In the war of 1870-71 Prince Kraft von

Hohenlohe-Ingelfingen, who commanded the Prussian Guard artillery, reported the expenditure of only one round of case, and even that was merely "broken in transport." The close-quarters projectile of to-day is more usually shrapnel with the fuze set at zero. Langlois, however, calls case shot "the true projectile for critical moments, which nothing can replace."

34. *Tactics of Field Artillery.*—On the march, the position and movement of the guns are regulated by the necessity of coming quickly into action; the usual place for the arm is at or near the heads of the combatant columns, *i.e.* as far forward as is consistent with safety. Safety is further provided for by an "escort," or, if such be not detailed, by the nearest infantry or cavalry. In attack, the role of the field artillery is usually (1) to assist if necessary the advanced guard in the preliminary fighting—for this purpose a battery is usually assigned to that corps of troops, other batteries also being sent up to the front as required, (2) to prepare, and (3) to support or cover the infantry attack. "Preparation" consists chiefly in engaging and subduing the hostile artillery. This is often spoken of as the "artillery duel," and is not a meaningless bombardment, but an essential preliminary to the advance. Massed guns with modern shrapnel would, if allowed to play freely upon the attack, infallibly stop, and probably annihilate, the troops making it. The task of the guns, then, is to destroy the opposing guns and artillerymen, a task which will engage almost all the resources of the assailant's artillery in the struggle for artillery superiority. Shielded guns, enhanced rate of fire, perfection in indirect laying apparatus, and many other factors, have modified the lessons of 1870, and complicated the work of achieving victory in the artillery duel so far that the simple "hard pounding" of former days has given way to a variety of expedients for inflicting the desired loss and damage, as to which opinions differ in and within every army. One point is, however, clear and meets with universal acceptance. "The whole object of the duel is to enable the artillery subsequently to devote all available resources to its principal task, which is the material and moral support of the infantry during each succeeding stage of the fight" (French regulations). One side must be victorious in the end, and when, and not until, the hostile artillery is beaten out of action, the victor has acquired the power of pressing home the attack. The British regulations (1906), indeed, deal with the steps to be taken when, though the artillery of the attack is beaten, the infantry advance is continued, but only so as to order the guns to "reopen at all costs," in other words, as a forlorn hope. The second part of the preparation, the gradual disintegration of the opposing line of infantry, has practically disappeared from the drill books. The next task of the guns, and that in which modern artillery asserts its power to the utmost, is the *support* of the infantry attack. The artillery and infantry co-operate, "the former by firing rapidly when they see their own infantry ... press forward, and the latter by making full use of the periods of intense artillery fire to gain ground" (British *F.A. Training*, 1906). Thus aided, the infantry closes in to decisive ranges, and as it gains ground to the front, every gun "must be at once turned upon the points selected ... the most effective support afforded to the attacking infantry by the concentrated fire of guns and field howitzers. The former tie the defenders to their entrenchments (for retreat is practically impossible over ground swept by shrapnel bullets), distract their attention and tend to make them keep their heads down, while the shell from the field howitzers searches out the interior of the trenches, the reverse slopes of the position, and checks the movement of reinforcements towards the threatened point." In these words the British Field Artillery drill-book of 1902 summarizes the act of "covering" the infantry advance. Unofficial publications are still more emphatic. The advance of the infantry to decisive range would often be covered by a mass of

one hundred or more field guns, firing shrapnel at the rate of ten rounds per gun per minute at the critical moment. Against such a storm of fire the defending infantry, even supposing that its own guns had refitted and were again in action, would be powerless. It is in recognition of the appalling power of field artillery (which has increased in a ratio out of all proportion to the improvements of modern rifles) that the French system has been elaborated to the perfection which it has now attained.

With modern guns and modern tactics artillery almost invariably fires over the heads of its own infantry. The German regulations indeed say that it should be avoided as far as possible, but, as a matter of fact, if the numerous guns of a modern army (at Königgrätz there were 1550 guns on the field, at Gravelotte 1252, at Mukden 3000) were to be given a clear front, there would be no room for deploying the infantry. Consequently the French regulations, in which the power of the artillery is given the greatest possible scope, say that "it almost always fires over the heads of its own infantry." With field guns and on level ground it is considered dangerous that infantry in front of the guns should be less than 600 yds. distant—not for fear of the shells striking the infantry, but because the fragments resulting from a "premature" burst are dangerous up to that distance. The question of distance is more important in connexion with the "covering" of the assault. Up to a point, the artillery enables the attacking infantry to advance with a minimum of loss and exhaustion, and thus to close with the enemy at least on equal terms, if not with a serious advantage, for the fire of the guns may shake, perhaps almost destroy the enemy's power of resistance. But when the infantry approaches the enemy the guns can no longer fire upon the latter's front line without risk of injuring their friends. All that they can do, when the opposing infantries can see the whites of each other's eyes, is to lengthen the fuze, raise the trajectory and sweep the ground where the enemy's supports are posted. Under these circumstances it is practically agreed that the risk should be taken without hesitation at so critical a moment as that of a decisive infantry assault which must be pushed home at whatever cost. "It will be better for the infantry to chance a few friendly shells than to be received at short range with a fresh outburst of hostile rifle fire" (Rouquerol, *Tactical Employment of Quick-firing Field Artillery*). Thus, the distance at which direct support ceases, formerly 600 yds., has been diminished to 100, and even to 50 yds. Howitzers can, of course, maintain their fire almost up to the very last stage, and, in general, high-explosive shell, owing to its purely local effect, may be employed for some time after it has become unsafe to use shrapnel.

35. Field artillery in *defence*, which would presumably be inferior to that of the attack, must, of course, act according to circumstances. We are here concerned not with the absolute strength or weakness of the passive defensive, which is a matter of tactics (*q.v.*), but with the tactical procedure of artillery, which, relatively to other methods, is held to offer the best chance of success, so far as success is attainable. On the defensive in a prepared position, which in European warfare at any rate will be an unusually favourable case for the defender—the guns have two functions, that of engaging and holding the hostile artillery, and that of meeting the infantry assault. The dilemma is this, that on the one hand a position in rear of the line of battle, with modern improvements in communicating and indirect laying apparatus, is well suited for engaging the hostile guns, but not for meeting the assault; and on the other, guns on the forward slope of the defender's ridge or hill can fire direct, but are quickly located and overwhelmed, for they can hardly remain silent while their own infantry bears the fire of the assailant's shrapnel. Thus the defender's guns would, as a rule, have to be divided. One portion would seek to fight from rearward concealed positions, and use every device to delay the victory of the enemy's guns and

the development of the battle until it is too late in the day for a serious infantry attack. Further, the enemy's mistakes and the "fortune of war" may give opportunities of inflicting severe losses; such opportunities have always occurred and will do so again. In the possible (though very far from probable) case of the defender not merely baffling, but crushing his opponent in the artillery duel, he may, if he so desires, himself assume the role of assailant, and at any rate he places a veto on the enemy's attack.

The portion told off to meet the infantry assault would be entrenched on the forward slope and would take no part in the artillery duel. Very exceptionally, this advanced artillery might fire upon favourable targets, but its paramount duty is to remain intact for the decisive moment. Here again the defender is confronted with grave difficulties. It is true that his advanced batteries may be of the greatest possible assistance at the crisis of the infantry assault, yet even so the covering fire of the hostile guns, as soon as the hostile infantry had found them their target, may be absolutely overwhelming; moreover, once the fight has begun, the guns cannot be withdrawn, nor can their positions easily be modified to meet unexpected developments. The proportion of the whole artillery force which should be committed to the forward position is disputed. Colonel Bethell (*Journal Royal Artillery*, vol. xxxiii. p. 67) holds that all the mountain guns, and two-thirds of the field guns, should be in the forward, all the howitzers and heavy guns and one-third of the field guns in the retired position. But in view of the facts that if once the advanced guns are submerged in the tide of the enemy's assault, they will be irrecoverable, and that a modern Q.F. gun, with plenty of ammunition at hand, may use "rapid fire" freely, artillery opinion, as a whole, is in favour of having fewer guns and an abnormal ammunition supply in the forward entrenchments, and the bulk of the artillery (with the ammunition columns at hand) in rear. But the purely passive defensive is usually but a preliminary to an active counter-stroke. This counter-attack would naturally be supported to the utmost by the offensive tactics of the artillery, which might thus at the end of a battle achieve far greater results than it could have done at the beginning of the day. In *pursuit*, it is universally agreed that the action of the artillery may be bold to the verge of rashness. The employment of field artillery in *advanced* and *rear guard actions* varies almost indefinitely according to circumstances; with *outposts*, guns would only be employed exceptionally.

36. *Marches.*—The importance of having the artillery well up at the front of a marching column is perhaps best expressed in the phrase of Prince Kraft von Hohenlohe-Ingelfingen, "save hours and not minutes." The Germans in 1870 so far acted up to the principle that Prince Hohenlohe, when asked, at the beginning of the battle of Sedan, for a couple of guns, was able to reply, "You shall have ninety" (see, for details of the march of the Guard artillery, his *Letters on Artillery*, 6th letter). The German regulations for field service say, very plainly, "the horses have not done their work until they have got the guns into action, even at the cost of utter exhaustion." A notable march was made by the 62nd battery, R.F.A., in the South African War. On the day of the battle of Modder River, the battery marched 32 m. (mostly through deep sand) arriving in time to take part in the action. Such forced marches, if rare, are nowadays expected to be within the power of field artillery to accomplish. Horse artillery is capable of more than this, and as to pace, manoeuvring at the cavalry rate. Heavy guns are the least mobile, and would rarely be able to keep pace with infantry in a forced march. Field artillery walks 4, trots 9, and gallops at the rate of 15 m. an hour. A fair marching pace (trot and walk) is 4 m. an hour for field, 5 for horse batteries. A march of 14 m. would, according to the German regulations, be performed by

a field battery in 5 hours,
a horse battery in 4 hours,

under favourable circumstances (Bronsart von Schellendorf).

37. *Power and Mobility.*—It will have been made clear that every gun represents a compromise between these two requirements, and that each type of artillery has been evolved in accordance with the relative requirements of these conditions in respect of the work to be performed. The classification which has been followed in this article represents the practically unanimous decision of every important military state. Still, there has always been controversy between the individual adherents of each side, and the Boer War experiences raised the question as to whether field artillery, as the term is usually understood, should not be abolished, with a view to having only heavy guns and horse artillery with a field army.

38. *Concentration and Dispersion.*—The use of their artillery made by the Boers in the South African War led to the revival of the idea of "dispersing" guns instead of "concentrating" them. It would be more accurate to say that military thinkers had, after the introduction of the quick-firing gun, challenged every received principle, and amongst others the employment of artillery in masses, which, as a result of the war of 1870, "had become almost an article of faith." The idea was to make use of the increased power of the guns to gain equally great results with the employment of less material than formerly. Thus the dispersion of guns is bound up with the passive defensive. The first editions of the British *Field Artillery Training* and *Combined Training*, strongly influenced as they were by South African experience, did not legislate, even in dealing with defence, for "dispersion" in the Boer manner, but only for adaptability (see *Field Artillery Training*, 1902, p. 15). In the Boer War, whilst the Boers nearly always scattered their guns, almost the only occasion upon which their artillery played a decisive part was at Spion Kop, where its fire was concentrated upon the point of assault. At Pieter's Hill, the fire of seventy guns covered the British infantry assault in the Napoleonic manner. On the whole it may be accepted as a general truth that guns are safe, and may be locally effective, when dispersed, but that they cannot produce decisive effect except when used in masses. It must, however, be clearly understood that a "mass" in this sense means a large number of guns, under one command, and susceptible of being handled as a unit, so far as the direction and effectiveness of their fire is concerned. *This being secured*, and on that condition only, it does not matter whether the actual gun positions are scattered over a few square miles, or are closed in one long line and using direct fire—they are still a mass, and capable of acting effectively as such. While there are undoubtedly grave dangers in using the indirect method too freely, technical improvements in laying, telephones, &c., have had much to do with the possibility, at any rate under favourable circumstances, of a concentration which may be described as one of shells rather than of guns, and the reader is reminded in this connexion that the work formerly done by the gun is now performed by the shell.

39. *Horse Artillery* is to be regarded as field artillery of great mobility and manoeuvring power. Its value may be said, in general terms, to lie in augmenting the weak fire-power of the mounted troops, and in facilitating their work as much as possible. Thus, when cavalry meets serious opposition in

reconnoitring, the guns may be able to break down the enemy's resistance without calling for assistance from the main body of the cavalry, and, in the action of cavalry *versus* cavalry, the "paramount duty of the horse artillery is to shatter the enemy's cavalry" (*Field Artillery Training*, 1906), *i.e.* to "prepare" the success of the cavalry charge by breaking up as far as possible the enemy's power of meeting it. In the cavalry battle, covering fire is practically impossible, owing both to the short distances separating the combatants and to the rapidity of their movements, but steps are taken "to enable all the guns to bear on the enemy's cavalry at the points of collision." The ideal position for the horse artillery is out to a flank, the cavalry manoeuvring so as to draw the enemy's cavalry under enfilade fire, and at the same time to force them to mask the fire of their own horse artillery. Another and a most important function of the horse batteries is to reinforce, with the greatest possible speed, any point in the general line of battle which is in need of artillery support. For this reason the corps artillery generally includes horse batteries.

40. *Field Howitzers* are somewhat less mobile than field guns; they have, however, far greater shell power. The special features of the weapon are, of course, the product of the special requirements which have called it into existence. These are, briefly (*a*) the necessity of being able to "search" the interior of earthworks, a task which, as has been said, is beyond the power of high-velocity field guns, and (*b*) demolition work, which is equally beyond the power of even a H.E. shell of field-gun calibre. The first of these conditions implies a steep "angle of descent," which again implies a high angle of elevation. The second requires great shell power but does not call for high velocity. The howitzer, therefore, is a short gun, firing a heavy shell at high angles of elevation. Howitzers almost always are laid by the indirect method of fire from under cover, since it is clear that, with high angles of elevation, the gun may be brought close up to the covering mass, and still fire over it. Ranging must be done very accurately and yet economically, as but few of their heavy shells can be carried in the wagons and limbers, and the shells descending upon an enemy almost vertically lose the long sweeping effect of the field shrapnel which neutralizes minor errors of ranging. The projectiles employed are high explosive and shrapnel, the latter for use against *personnel* under cover, the former for demolition of field works, casemates or buildings. It is very generally held that howitzer time shrapnel is the best form of projectile for the attack of shielded guns. Here it may be said that no completely satisfactory method of dealing with these has yet been discovered. The best procedure with field guns is said to be lengthening the fuze to obtain a high percentage of bursts on graze. A shell striking the face of the shield will penetrate it, and should kill some at least of the gun detachment behind. The high-explosive shrapnel alluded to above is designed primarily for the attack of shielded guns.

41. *Heavy Field Artillery*, alternatively called *Artillery of Position*, as has been said, includes all guns of 4-in. calibre and upwards, mounted on travelling carriages. In South Africa, where firm soil was usually to be found, 6-in. guns were employed as heavy field guns, but in Europe even the 5-in. (British Service) is liable to sink into the ground. In Great Britain, guns only are used by this branch; abroad, the "heavy artillery of the field army," the "light siege train," &c., as it is variously called, is as a rule composed of howitzers of a heavier calibre than the field howitzer, the 15-cm. (6-in.) howitzer being most commonly met with. This artillery has, however, a different tactical rôle from the heavy field artillery of the British service; and it is always with a view to the attack of permanent or semi-permanent fortifications that the *matériel* is organized. In Great Britain, heavy batteries armed with the 5-in. gun are considered as "an auxiliary to the horse and field artillery" (*Heavy Artillery Training*). Ranging is

conducted with greater deliberation than ranging with the lighter guns, though upon the same general lines. Parts of the process may, however, be omitted in certain circumstances. Heavy guns use high-explosive (lyddite) shells and time shrapnel, the former for ranging and for demolishing cover, the latter against *personnel*. Laying is usually indirect. The tactical principles upon which heavy artillery does its work are based, in the main, on the long range (up to 10,000 yds.) and great shell-power of the guns. This power enables the artillery to reach with effect targets which are beyond the range of lighter ordnance, and it is, therefore, considered possible to disperse the guns in batteries, and even in sections of two guns, along the front of the army, without forfeiting the power of concentrating their fire on any point—a power which otherwise they would not possess owing to their want of mobility. At the same time it is not forbidden to bring them into line with the rest of the artillery, in order to achieve a decisive result. In the *attack*, beside the general task of supplementing the effect of other natures of ordnance, heavy artillery may demolish cover, buildings, &c., held by the enemy, and during the infantry assault they may do excellent service in sweeping a great depth of ground, their smaller angle of descent, and the greater remaining velocity and heavier driving charge of their shrapnel, as compared with field guns, enabling them to do this effectively. In the *defence*, long-range fire has great value, especially in sweeping approaches which the enemy must use. In *pursuit*, the heavy artillery may be able to shell the main body of the enemy during its retreat, even if it has left a rearguard. In *retreat*, the want of mobility of these guns militates against their employment in exposed positions, such as rearguards usually have to take up.

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Guibert's, on war. See also de Morla, *Tratado de la Artilleria* (1784), translated into German by Hoyer (*Lehrbuch der Art.-Wissenschaft*, Leipzig, 1821-1826); *Du Service de l'artillerie à la guerre* (Paris, 1780, German translation, Dresden, 1782, and English, by Capt. Thomson, R.A., London, 1789), Bardet de Villeneuve's *Traité de l'artillerie* (Hague, 1741), and Hennébert, *Gribeauval, Lieut.-Général des armées du Roy* (Paris, 1896). Important works of the period 1800-1850 are Scharnhorst, *Handbuch der Artillerie* (Hanover, 1804-1806, French translation by Fourcy, *Traité sur l'artillerie*, Paris, 1840-1841); Rouvroy, *Vorlesungen über die Artillerie* (Dresden, 1821-1825); Timmerhans, *Essai d'un traité d'artillerie* (Brussels, 1839-1846); C. v. Decker, *Die Artillerie für alle Waffen* (1826); Griffiths, *The Artillerist's Manual* (Woolwich, 1840); Piobert, *Traité d'artillerie* (Paris, 1845-1847); Taubert (translated by Maxwell), *Use of Field Artillery on Service* (London, 1856); Capt. Simmonds, R.A., *Application of Artillery in the Field* (London, 1819); Gassendi, *Aide-mémoire à l'usage des officiers d'artillerie* (Paris, 1819). See also Girod de l'Ain, *Grands artilleurs, Drouot, Sénarmont, Éblé* (Paris, 1894). Among the numerous works on modern field artillery may be mentioned Prince Hohenlohe-Ingelfingen, *Briefe über Artillerie* (Berlin, 1887, 2nd ed., English translation by Col. Walford, *Letters on Artillery*, Woolwich, 1887); Hoffbauer, *Taktik der Feldartillerie, 1866 und 1870-1871* (Berlin, 1876), and *Applikatorische Studie über Verwendung der Artillerie* (Berlin, 1884); Erb, *L'Artillerie dans les batailles de Metz* (Paris, 1906); Leurs, *L'Art. de campagne prussienne 1864-1870* (Brussels, 1874); v. Schell, *Studie über Taktik der Feldartillerie* (quoted above); Hennébert, *Artillerie moderne* (Paris, 1889); and for quick-firing artillery, Langlois, *Artillerie de campagne en liaison avec les autres armes* (Paris, 1892 and 1907); Wille, *Feldgeschütz der Zukunft* (Berlin, 1891); *Waffenlehre* (2nd ed., 1901); and *Zur Feldgeschützfrage* (Berlin, 1896); Rohne, *Die Taktik der Feldartillerie* (Berlin, 1900), *Studie über d. Schnellfeuergeschütze in Rohrrücklauflafette* (Berlin, 1901), *Die französische Feldartillerie* (Berlin, 1902); *Entwicklung des Massengebrauchs der Feldartillerie* (Berlin, 1900); and articles in *Jahrbücher f. d. Deutsche Armee und Marine* (October 1901 and January 1905); Hoffbauer, *Die Frage des Schnellfeuerfeldgeschützes* (Berlin, 1902), and *Verwendung der Feldhaubitzen* (Berlin, 1901); Wangemann, *Für die leichte Feldhaubitze* (Berlin, 1904); von Reichenau, *Studie über ... Ausbildung der Feldart*. (Berlin, 1896), *Einfluss der Schilde auf die Entwicklung des F.-A. Materials*, and *Neue Studien über die Entwicklung der Feldart.* (Berlin, 1902 and 1903); Smekal, *Führung und Verwendung der Divisions-Artillerie* (Vienna, 1901); Korzen and Kühn, *Waffenlehre* (Vienna, 1906); G. Rouquerol, *Emploi de l'artillerie de campagne à tir rapide* (Paris, 1901), and *Organisation de l'artillerie de campagne* (Paris, 1903); Girardon-Lagabbe, *Organisation du matériel de l'artillerie de campagne* (Paris, 1903); and in English, Capt. P. de B. Radcliffe's translation of Rouquerol's work (*The Tactical Employment of Quick-firing Field Artillery*, London, 1903), and especially Lt.-Col. H.A. Bethell, *Modern Guns and Gunnery* (Woolwich, 1907). See also the current drill manuals of the British, French and German artillery.

(C. F. A.)

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1 Napoleon's maxim, quoted above, reappears in spirit in the British F.A. Training of 1906 (p. 225).

2 The old smooth-bore mortar for high-angle fire has of course disappeared, but the name "mortar" is still applied in some countries to short rifled howitzers.

3 Though not of course against the direct impact of shrapnel or H.E. shells.

4 Finding the line is also an integral part of ranging. When an aiming point is used, the angle at which the guns must be laid with reference to it is calculated and given out by the battery commander. The modern goniometric sight permits of a wide angle (in England 180° right or left) being given. “Deflection” is a small angular correction applied to individual guns.

5 The “corrector” is an adjustment on the sights of the gun used to determine the correct fuze. In the British Q.F. equipment, a graduated dial or drum shows the elevation of the gun above the line of sight. The fuze lengths are marked on a movable scale opposite the range graduations to which they apply, and the “corrector” moves this fuze scale so as to bring different fuze lengths opposite the range graduation. For example, a certain corrector setting gives 11½ on the fuze scale opposite 4000 yds. on the range scale, and if the shells set to 11½ burst too high, a new corrector setting is taken, the fuze length 12 is now opposite to the 4000 range graduation, and this length gives bursts closer up and lower. In the German service a corrector (*Aufsatzschieber*) alters the real elevation given to the gun, so that while throughout the battery all guns have the same (nominal or ordered) elevation shown on the sights, the real elevations of individual guns vary according to the different corrector settings. Thus bursts at different heights and distances from the target are obtained by shifting the trajectory of the shell. The fuze, being set for the nominal elevation common to all the guns, burns for the same time in each case, and thus the burst will be lower and closer to the target with a less (real) elevation, and higher and farther from it with a greater.

6 Most of the works named deal with technical questions of equipment, ammunition, ballistics, &c.

ARTIODACTYLA (from Gr. ἄρτιος, even, and δάκτυλος, a finger or toe, “even-toed”), the suborder of ungulate mammals in which the central (and in some cases the only) pair of toes in each foot are arranged symmetrically on each side of a vertical line running through the axes of the limbs. As contrasted with the Perissodactyla living, and in a great degree extinct, Artiodactyla are characterized by the following structural features. The upper premolar and molar teeth are not alike, the former being single and the latter two-lobed; and the last lower molar of both first and second dentition is almost invariably three-lobed. Nasal bones not expanded posteriorly. No alisphenoid canal. Dorsal and lumbar vertebrae together always nineteen, though the former may vary from twelve to fifteen. Femur without third trochanter. Third and fourth digits of both feet almost equally developed, and their terminal phalanges flattened on their inner or contiguous surfaces, so that each is not symmetrical in itself, but when the two are placed together they form a figure symmetrically disposed to a line drawn between them. Or, in other words, the axis or median line of the whole foot is a line drawn between the third and fourth digits (fig. 1). Lower articular surface of the astragalus divided into two nearly equal facets, one for the navicular and a second for the cuboid bone. The calcaneum with an articular facet for the lower end of the fibula. Stomach almost always more or less complex. Colon convoluted. Caecum small. Placenta diffused or cotyledonary. Teats either few and inguinal, or numerous and abdominal.

Artiodactyla date from the Eocene period, when they appear to have been less numerous than the Perissodactyla, although at the present day they are immeasurably ahead of that group, and form indeed the dominant ungulates. As regards the gradual specialization and development of the modern types, the following features are noteworthy.

1. As regards the teeth, we have the passage of a simply tubercular, or bunodont (βουνός, a hillock) type of molar into one in which the four main tubercles, or columns, have assumed a crescentic form, whence this type is termed selenodont (σελήνη, the new moon). Further, there is the modification of the

latter from a short-crowned, or brachyodont type, to one in which the columns are tall, constituting the hypsodont, or hypsiselenodont, type. It is noteworthy, however, that in some instances there appears to have been a retrograde modification from the selenodont towards the bunodont type, the hippopotamus being a case in point. Other modifications are the loss of the upper incisors; the development of the canines into projecting tusks; and the loss of the anterior premolars.

2. As regards the limbs. Reduction of the ulna from a complete and distinct bone to a comparatively rudimentary state in which it coalesces more or less firmly with the radius. Reduction of the fibula till nothing but its lower extremity remains. Reduction and final loss of outer pair of digits (second and fifth), with coalescence of the metacarpal and metatarsal bones of the two middle digits to form a cannon-bone. Union of the navicular and cuboid, and sometimes the ectocuneiform bone, of the tarsus.

3. Change of form of the odontoid process of the second or axis vertebrae from a cone to a hollow half-cylinder.

4. Development of horns or antlers on the frontal bones, and gradual complication of form of antlers.

5. By inference only, increasing complication of stomach with ruminating function superadded. Modification of placenta from simple diffused to cotyledonary form.

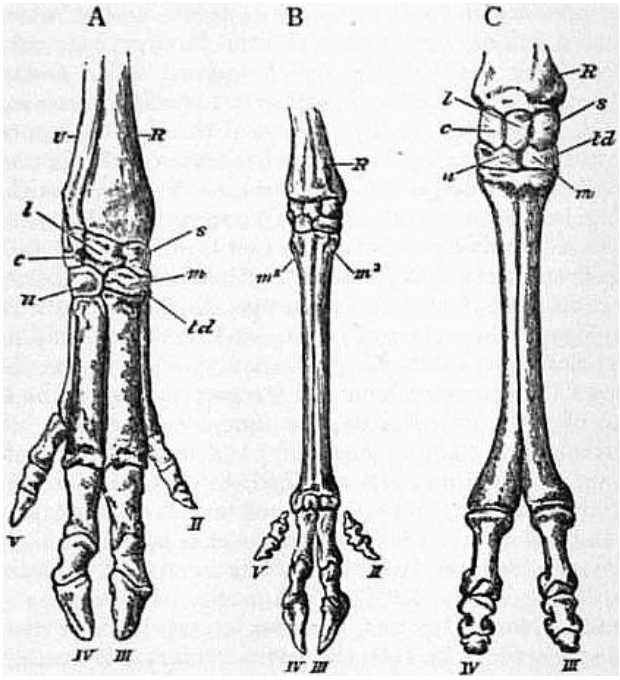

FIG. 1.—Bones of Right Fore Feet of existing Artiodactyla.

A, Pig (*Sus scrofa*).
B, Red deer (*Cervus elaphus*).
C, Camel (*Camelus bactrianus*).
U, Ulna.
R, Radius.
c, Cuneiform.
l, Lunar.
s, Scaphoid.
u, Unciform.
m, Magnum.
td, Trapezoid.

In the Sheep and the Camel the long compound bone, supporting the two main (or only) toes is the cannon-bone.

The primitive Artiodactyla thus probably had the typical number (44) of incisor, canine and molar teeth, brachyodont molars, conical odontoid process, four distinct toes on each foot, with metacarpal, metatarsal and all the tarsal bones distinct, and no frontal appendages.

Pecora.

As regards classification, the first group is that of the Pecora, or Cotylophora, in which the cheek-teeth are selenodont, but there are no upper incisors or canine-like premolars, while upper canines are generally absent, though sometimes largely developed. Inferior incisors, three on each side with an incisiform canine in contact with them. Cheek-teeth consisting of $p.\frac{3}{3}$, $m.\frac{3}{3}$, in continuous series. Auditory bulla simple and hollow within. Odontoid process of second vertebra in the form of a crescent, hollow above. Lower extremity of the fibula represented by a distinct malleolar bone articulating with the outer surface of the lower end of the tibia. Third and fourth metacarpals and metatarsals confluent into cannon-bones (fig. 1 B), and the toes enclosed in hoofs. Outer toes small and rudimentary, or in some cases entirely suppressed; their metacarpal or metatarsal bones never complete. Navicular and cuboid bones of tarsus united. The skull generally lacks a sagittal crest; and the condyle of the lower jaw is transversely elongated. Horns or antlers usually present, at least in the male sex. Left brachial artery arising from a common innominate trunk, instead of coming off separately from the aortic arch. Stomach with four complete cavities. Placenta cotyledonous. Teats 2 or 4.

The group at the present day is divided into *Giraffidae* (giraffe and okapi), *Cervidae* (deer), *Antilocapridae* (prongbuck), and *Bovidae* (oxen, sheep, goats, antelopes, &c.). (See PECORA.)

Tylopoda.

The second group is represented at the present day by the camels (*Camelus*) of the Old, and the llamas (*Lama*) of the New World, collectively constituting the family *Camelidae*. They derive their name of Tylopoda ("boss-footed") from the circumstance that the feet form large cushion-like pads, supporting the weight of the body, while the toes have broad nails on their upper surface only, instead of being encased in hoofs. The cheek-teeth are selenodont, and one pair of upper incisors is retained, while some of the anterior premolars assume a canine-like shape, and are separated from the rest of the cheek-series. Auditory bulla filled with honeycombed bony tissue. Odontoid process of second vertebra semi-cylindrical; skull with a sagittal crest; and the condyle of the lower jaw rounded. Third and fourth metacarpals and metatarsals (which are alone present) fused into cannon-bones for the greater part of their length, but diverging inferiorly (fig. 1, C) and with their articular surfaces for the toes smooth, instead of ridged as in the Pecora. Navicular and cuboid bones of tarsus distinct. No horns or antlers. Stomach, although complex, differing essentially from that of the Pecora. Placenta diffuse, without cotyledons. Teats few. (See TYLOPODA.)

In the same sectional group is included the North American family of oreodonts (*Oreodontidae*), which are much more primitive ruminants, with shorter necks and limbs, the full series of 44 teeth, all in apposition, and the metacarpal and metatarsal bones separate, and the toes generally of more normal type, although sometimes claw-like. (See OREODON.) The Eocene American genus *Homacodon* is regarded as representing a third family group, the *Homacodontidae* (= *Pantolestidae*), in which the molars were of a bunodont type, and approximate to those of the Condylarthra from which this family appears to have sprung, and to have given origin on the one hand to the *Oreodontidae*, and on the other

to the *Camelidae*. The family is represented in the Lower, or Wasatch, Eocene by *Trigonolestes*, in the Middle (Bridger) Eocene by *Homacodon* (Pantolestes), and in the Upper (Uinta) Eocene by *Bunomeryx*.

Tragulina.

The third group is that represented by the chevrotains or mouse-deer, forming the family *Tragulidae*, with *Tragulus* in south-eastern Asia and *Dorcatherium* (or *Hyomoschus*) in equatorial Africa. The cheek-teeth are selenodont, as in the two preceding groups; there are no upper incisors, but there are long, narrow and pointed upper canines, which attain a large size in the males; the lower canines are incisor-like, as in the Pecora, and there are no caniniform premolars in either jaw. Cheek-teeth in a continuous series consisting of $p.\frac{3}{3}$, $m.\frac{3}{3}$. Odontoid process of axis conical. Fibula complete. Four complete toes on each foot. The middle metacarpals and metatarsals generally confluent, the outer ones (second and fifth) slender but complete, *i.e.* extending from the carpus or tarsus to the digit. Navicular, cuboid and ectocuneiform bones of tarsus united. Auditory bulla of skull filled with cancellar tissue. No frontal appendages. Ruminating, but the stomach with only three distinct compartments, the maniplies or third cavity of the stomach of the Pecora being rudimentary. Placenta diffused. (See CHEVROTAIN.)

Anoplotherina.

In this place must be mentioned the extinct Oligocene European group typified by the well-known genus *Anoplotherium* of the Paris gypsum-quarries, and hence termed Anoplotherina, although the alternative title Dichobunoidea has been suggested. It includes the two families *Anoplotheriidae* and *Dichobunidae*, of which the first died out with the Oligocene, while the second may have given origin to the Tragulina and perhaps the Pecora. There is the full series of 44 teeth, generally without any gaps, and most of the bones of the skeleton are separate and complete; while, in many instances at any rate, the tail was much longer than in any existing ungulates, and the whole bodily form approximated to that of a carnivore. The upper molars, which may be either selenodont or buno-selenodont, carry five cusps each, instead of the four characteristic of all the preceding groups; and they are all very low-crowned, so as to expose the whole of the valleys between the cusps. In *Anoplotherium*, some of the species of which were larger than tapirs, there were either two or three toes, the latter number being almost unique among the Artiodactyla. Allied genera are *Diplobune* and *Dacrytherium.*

The *Dichobunidae* include the genus *Dichobune*, of which the species were small animals with buno-selenodont molars. *Xiphodon* and *Dichodon* represent another type with cutting premolars and selenodont molars; while *Caenotherium* and *Plesiomeryx* form yet another branch, with resemblances to the ruminants. The most interesting genera are however, the Upper Oligocene and Lower Miocene *Gelocus* and *Prodremotherium*, which have perfectly selenodont teeth, and the third and fourth metacarpal and metatarsal bones respectively fused into an imperfect cannon-bone, with the reduction of the lateral metacarpals and metatarsals to mere remnants of their upper and lower extremities. While *Gelocus* exhibits a marked approximation to the *Tragulidae, Prodremotherium* comes nearer to the *Cervidae*, of which it not improbably indicates the ancestral type. The *Dichobunidae* may be regarded as occupying a position analogous to that of the *Homacodontidae* in the Tylopoda, and like the latter, are probably the direct descendants of Condylarthra.

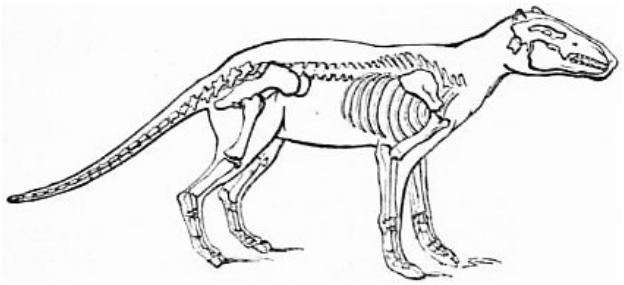

FIG. 2.—Restoration of *Anoplotherium commune.*

Suina.

The last section of the Artiodactyla is that of the Suina, represented at the present day by the pigs (*Suidae*), and the hippopotamuses (*Hippopotamidae*), and in past times by the *Anthracotheriidae*, in which may probably be included the *Elotheriidae.* In the existing members of the group the cheek-teeth approximate to the bunodont type, although showing signs of being degenerate modifications of the selenodont modification. There is at least one pair of upper incisors, while the full series of 44 teeth may be present. The metacarpals and metatarsals are generally distinct (fig. 1 A), and never fuse into a complete cannon-bone; and the navicular and cuboid bones of the tarsus are separate. The odontoid process of the second vertebra is pig-like: and the tibia and fibula and radius and ulna are severally distinct. The stomach is simple or somewhat complex, and the placenta diffused. The *Suidae* include the Old World pigs (*Suinae*) and the American peccaries (*Dicotylinae*), and are characterized by the snout terminating in a fleshy disk-like expansion, in the midst of which are perforated the nostrils; while the toes are enclosed in sharp hoofs, of which the lateral ones do not touch the ground. There is a caecum. The *Dicotylinae* differ from the *Suinae* in that the upper canines are directed downwards (instead of curving upwards) and have sharp cutting-edges, while the toes are four in front and three behind (instead of four on each foot), and the stomach is complex instead of simple. In the Old World a large number of fossil forms are known, of which the earliest is the Egyptian Eocene *Geniohyus.* Originally the family was an Old World type, but in the Miocene it gained access into North America, where the earliest form is *Bothriolabis*, an ancestral peccary showing signs of affinity with the European Miocene genus *Palaeochoerus.* (See SWINE and PECCARY.)

The *Hippopotamidae* are an exclusively Old World group, in which the muzzle is broad and rounded and quite unlike that of the *Suidae*, while the crowns of the cheek-teeth form a distinctly trefoil pattern, when partially worn, which is only foreshadowed in those of the latter. The short and broad teeth terminate in four subequal toes, protected by short rounded hoofs, and all reaching the ground. The hinder end of the lower jaw is provided with a deep descending flange. Both incisors and canines are devoid of roots and grow throughout life, the canines, and in the typical species one pair of lower incisors, growing to an immense size. The stomach is complex; but there is no caecum. Although now exclusively African, the family (of which all the representatives may be included in the single genus *Hippopotamus*, with several subgeneric groups) is represented in the Pliocene of Europe and the Lower Pliocene of northern India. Its place of origin cannot yet be determined.

The extinct *Anthracotheriidae* were evidently nearly allied to the *Hippopotamidae*, of which they are in all probability the ancestral stock. They agree, for instance, with that family in the presence of a

descending flange at the hinder end of each side of the lower jaw; but their dentition is of a more generalized type, comprising the full series of 44 teeth, among which the incisors and canines are of normal form, but specially enlarged, and developing roots in the usual manner. The molars are partially selenodont in the typical genus *Anthracotherium*, with five cusps, or columns, on the crowns of those of the upper jaw, which are nearly square. The genus has a very wide distribution, extending from Europe through Asia to North America, and occurring in strata which are of Oligocene and Miocene age. In *Ancodon* (*Hyopotamus*) the cusps on the molars are taller, so that the dentition is more decidedly selenodont; the distribution of this genus includes not only Europe, Asia and North Africa, but also Egypt where it occurs in Upper Eocene beds in company with the European genus *Rhagatherium*, which is nearer *Anthracotherium.* On the other hand, in *Merycopotamus*, of the Lower Pliocene of India and Burma, the upper molars have lost the fifth intermediate cusp of *Ancodon*; and thus, although highly selenodont, might be easily modified, by a kind of retrograde development, into the trefoil-columned molars of *Hippopotamus.* In the above genera, so far as is known, the feet were four-toed, although with the lateral digits relatively small; but in *Elotherium* (or *Entelodon*), from the Lower Miocene of Europe and the Oligocene of North America, the two lateral digits in each foot had disappeared. This is the more remarkable seeing that *Elotherium* may be regarded as a kind of bunodont *Anthracotherium.* It shows the characteristic hippopotamus-flange to the lower jaw, but has also a large descending process from the jugal bone of the zygomatic arch of the skull. Finally, we have in the Pliocene of India the genus *Tetraconodon*, remarkable for the enormous size attained by the bluntly conical premolars; as the molars are purely bunodont, this genus seems to be a late and specialized survivor of a primitive type.

(R. L.*)

ARTISAN, or ARTIZAN, a mechanic; a handicraftsman in distinction to an artist. The English word (from Late Lat. *artitianus*, instructed in arts) at one time meant “artist,” but has been restricted to signify the operative workman only.

ARTOIS, an ancient province of the north of France, corresponding to the present department of Pas de Calais, with the exclusion of the arrondissements of Boulogne and Montreuil, which belonged to Picardy. It is a rich and well-watered country, producing abundance of grain and hops, and yielding excellent pasture for cattle. The capital of the province was Arras, and the other important places were Saint-Omer, Béthune, Aire, Hesdin, Bapaume, Lens, Lillers, Saint-Pol and Saint-Venant. The name Artois (still more corrupted in “Arras”) is derived from the Atrebates, who possessed the district in the

time of Caesar. From the 9th to the 12th century Artois belonged to the counts of Flanders. It was bestowed in 1180 on Philip Augustus of France by Philip of Alsace, as the dowry of his niece Isabella of Hainaut. At her death in 1190, Baldwin IX., count of Flanders (d. 1206), and then his son-in-law, Ferrand (Ferdinand) of Portugal, count of Flanders, disputed the possession of the country with the king of France, Ferrand being in the coalition which was overthrown by Philip Augustus at Bouvines (1214). In 1237 Artois, which was raised to a countship the following year, was conferred as an appanage by Saint Louis on his brother Robert, who died on crusade in 1250. His son, Robert II., took part in the wars in Navarre, Sicily, Guienne and Flanders, and was killed at the battle of Courtrai in 1302. After his death, his son Philip having predeceased him (1298), Artois was adjudged to his daughter Mahaut, or Matilda, as against her nephew Robert, son of Philip, who attempted to support his claim to the countship by forged titles. Banished from France for this crime (1322), Robert of Artois took refuge in England, where he became earl of Richmond, and incited Edward III. to make war upon Philip of Valois. His descendants, the counts of Eu (*q.v.*), continued to style themselves counts of Artois. By the marriage of Mahaut (d. 1329) with Otto IV., Artois passed to the house of Burgundy, in whose possession it remained till the marriage of Mary, the daughter of Charles the Bold, to the archduke Maximilian brought it to the house of Austria. Louis XI., however, occupied portions of Artois, and the claims of Austria were contested by France until the treaty of Senlis (1493). The emperor Charles V. established the council of Artois, with sovereign authority. At the end of the Thirty Years' War Artois was again conquered by the French, and the conquest was ratified in the treaty of the Pyrenees (1659) by Spain, to whom the province had fallen in 1634. During the war between France and Holland (1672-77) and that of the Spanish Succession. Artois was invaded again, but the treaties of Nijmwegen (1678) and of Utrecht (1713) confirmed the sovereignty of France. The title of count of Artois was borne by Charles X. of France before his accession to the throne. This new creation became extinct on the death of the comte de Chambord in 1883.

ART SALES. The practice of selling objects of art by auction in England dates from the latter part of the 17th century, when in most cases the names of the auctioneers were suppressed. Evelyn (under date June 21, 1693) mentions a "great auction of pictures (*Lord Melford's*) in the Banquetting House, Whitehall," and the practice is frequently referred to by other contemporary and later writers. Before the introduction of regular auctions the practice was, as in the case of the famous collection formed by Charles I., to price each object and invite purchasers, just as in other departments of commerce. But this was a slow process, especially in the case of pictures, and lacked the incentive of excitement. The first really important art collection to come under the hammer was that of Edward, earl of Oxford, dispersed by Cock, under the Piazza, Covent Garden, on 8th March 1741/2 and the five following days, six more days being required by the coins. Nearly all the leading men of the day, including Horace Walpole, attended or were represented at this sale, and the prices varied from five shillings for an anonymous bishop's "head" to 165 guineas for Vandyck's group of "Sir Kenelm Digby, lady, and son." The next

great dispersal was Dr Richard Mead's extensive collection, of which the pictures, coins and gems, &c., were sold by Langford in February and March 1754, the sale realizing the total, unprecedented up to that time, of £16,069. The thirty-eight days' sale (1786) of the Duchess of Portland's collection is very noteworthy, from the fact that it included the celebrated Portland vase, now in the British Museum. Many other interesting and important 18th-century sales might be mentioned. High prices did not become general until the Calonne, Trumbull (both 1795) and Bryan (1798) sales. As to the quality of the pictures which had been sold by auction up to the latter part of the 18th century, it may be assumed that this was not high. The importation of pictures and other objects of art had assumed extensive proportions by the end of the 18th century, but the genuine examples of the Old Masters probably fell far short of 1%. England was felt to be the only safe asylum for valuable articles, but the home which was intended to be temporary often became permanent. Had it not been for the political convulsions on the continent, England, instead of being one of the richest countries in the world in art treasures, would have been one of the poorest. This fortuitous circumstance had, moreover, another effect, in that it greatly raised the critical knowledge of pictures. Genuine works realized high prices, as, for example, at Sir William Hamilton's sale (1801), when Beckford paid 1300 guineas for the little picture of "A Laughing Boy" by Leonardo da Vinci; and when at the Lafontaine sales (1807 and 1811) two Rembrandts each realized 5000 guineas, "The Woman taken in Adultery," now in the National Gallery, and "The Master Shipbuilder," now at Buckingham Palace. The Beckford sale of 1823 (41 days, £43,869) was the forerunner of the great art dispersal of the 19th century; Horace Walpole's accumulation at Strawberry Hill, 1842 (24 days, £33,450), and the Stowe collection, 1848 (41 days, £75,562), were also celebrated. They comprised every phase of art work, and in all the quality was of a very high order. They acted as a most healthy stimulus to art collecting, a stimulus which was further nourished by the sales of the superb collection of Ralph Bernal in 1855 (32 days, £62,690), and of the almost equally fine but not so comprehensive collection of Samuel Rogers, 1856 (18 days, £42,367). Three years later came the dispersal of the 1500 pictures which formed Lord Northwick's gallery at Cheltenham (pictures and works of art, 18 days, £94,722).

Towards the latter part of the first half of the 19th century an entirely new race of collectors gradually came into existence; they were for the most part men who had made, or were making, large fortunes in the various industries of the midlands and north of England and other centres. They were untrammelled by "collecting" traditions, and their patronage was almost exclusively extended to the artists of the day. The dispersals of these collections began in 1863 with the Bicknell Gallery, and continued at irregular intervals for many years, *e.g.* Gillott (1872), Mendel (1875), Wynn Ellis and Albert Levy (1876), Albert Grant (1877) and Munro of Novar (1878). These patrons purchased at munificent prices either direct from the easel or from the exhibitions not only pictures in oils but also water-colour drawings. As a matter of investment their purchases frequently realized far more than the original outlay; sometimes, however, the reverse happened, as, for instance, in the case of Landseer's "Otter Hunt," for which Baron Grant is said to have paid £10,000 and which realized shortly afterwards only 5650 guineas. One of the features of the sales of the 'seventies was the high appreciation of water-colour drawings. At the Gillott sale (1872) 160 examples realized £27,423, Turner's "Bamborough Castle" fetching 3150 gns.; at the Quilter sale (1875) David Cox's "Hayfield," for which a dealer paid him 50 gns. in 1850, brought 2810 gns. The following are the most remarkable prices of later years. In 1895 Cox's "Welsh Funeral" (which

cost about £20) sold for 2400 gns., and Burne-Jones's "Hesperides" for 2460 gns. In 1908, 13 Turner drawings fetched £12,415 (Acland-Hood sale) and 7 brought £11,077 (Holland sale), the "Heidelberg" reaching 4200 gns. For Fred Walker's "Harbour of Refuge" 2580 gns. were paid (Tatham sale) and 2700 gns. for his "Marlow Ferry" (Holland). The demand for pictures by modern artists, whose works sold at almost fabulous prices in the 'seventies, has somewhat declined; but during all its *furore* there was still a small band of collectors to whom the works of the Old Masters more especially appealed. The dispersal of such collections as the Bredel (1875), Watts Russell (1875), Foster of Clewer Manor (1876), the Hamilton Palace (17 days, £397,562)—the greatest art sale in the annals of Great Britain—Bale (1882), Leigh Court (1884), and Dudley (1892) resulted, as did the sale of many minor collections each season, in many very fine works of the Old Masters finding eager purchasers at high prices. A striking example of the high prices given was the £24,250 realized by the pair of Vandyck portraits of a Genoese senator and his wife in the Peel sale, 1900.

Since the last quarter of the 19th century the chief feature in art sales has been the demand for works, particularly female portraits, by Reynolds, his contemporaries and successors. This may be traced to the South Kensington Exhibitions of 1867 and 1868 and the annual winter exhibitions at Burlington House, which revealed an unsuspected wealth and charm in the works of many English artists who had almost fallen into oblivion. A few of the most remarkable prices for such pictures may be quoted: Reynolds's "Lady Betty Delmé" (1894), 11,000 gns.; Romney's "The Ladies Spencer" (1896), 10,500 gns.; Gainsborough's "Duchess of Devonshire" (1876), 10,100 gns. (for the history of its disappearance see GAINSBOROUGH, THOMAS), "Maria Walpole," 12,100 gns. (Duke of Cambridge's sale, 1904); Constable's "Stratford Mill" (1895), 8500 gns.; Hoppner's "Lady Waldegrave" (1906), 6000 gns.; Lawrence's "Childhood's Innocence" (1907), 8000 gns.; Raeburn's "Lady Raeburn" (1905), 8500 gns. Here may also be mentioned the 12,600 gns. paid for Turner's "Mortlake Terrace" in 1908 (Holland sale).

The "appreciation" of the modern continental schools, particularly the French, has been marked since 1880; of high prices paid may be mentioned Corot's "Danse des Amours" (1898), £7200; Rosa Bonheur's "Denizens of the Highlands" (1888), 5550 gns.; Jules Breton's "First Communion," £9100 in New York (1886); Meissonier's "Napoleon I. in the Campaign of Paris," 12¼ in. by 9¼ in. (1882), 5800 gns., and "The Sign Painter" (1891), 6450 gns. High prices are also fetched by pictures of Daubigny, Fortuny, Gallait, Gérôme, Troyon and Israëls. The most marked feature of late has been the demand for the 18th-century painters Watteau, Boucher, Fragonard, Pater and Lancret; thus "La Ronde Champêtre" of the last named brought £11,200 at the Say Sale in 1908, and Fragonard's "Le Reveil de Vénus" £5520 at the Sedelmeyer sale, 1907.

"Specialism" is the one important development in art collecting which has manifested itself since the middle of the 19th century. This accounts for and explains the high average quality of the Wellesley (1866), the Buccleuch (1888) and the Holford (1893) collections of drawings by the Old Masters; for the Sibson Wedgwood (1877), the Duc de Forli Dresden (1877), the Shuldham blue and white porcelain (1880), the Benson collection of antique coins (1909), and for the objects of art at the Massey-Mainwaring and Lewis-Hill sales of 1907. Very many other illustrations in nearly every department of art collecting might be quoted—the superb series of Marlborough gems (1875 and 1899) might be included in this category but for the fact that it was formed chiefly in the 18th century. The appreciation

—commercially at all events—of mezzotint portraits and of portraits printed in colours, after masters of the early English school, was one of the most remarkable features in art sales during the last years of the 19th century. The shillings of fifty years before were then represented by pounds. The Fraser collection (December 4 to 6, 1900) realized about ten times the original outlay, the mezzotint of the "Sisters Frankland," after Hoppner, by W. Ward, selling for 290 guineas as against 10 guineas paid for it about thirty years previously. The H.A. Blyth sale (March 11 to 13, 1901, 346 lots, £21,717 : 10s.) of mezzotint portraits was even more remarkable, and as a collection it was the choicest sold within recent times, the engravings being mostly in the first state. The record prices were numerous, and, in many cases, far surpassed the prices which Sir Joshua Reynolds received for the original pictures; *e.g.* the exceptionally fine example of the first state of the "Duchess of Rutland," after Reynolds, by V. Green, realized 1000 guineas, whereas the artist received only £150 for the painting itself. Even this unprecedented price for a mezzotint portrait was exceeded on the 30th of April 1901, when an example of the first published state of "Mrs Carnac," after Reynolds, by J.R. Smith, sold for 1160 guineas. At the Louis Huth sale (1905) 83 lots brought nearly £10,000, Reynolds's "Lady Bampfylde" by T. Watson, first state before letters, unpublished, fetching 1200 guineas. Such prices as these and many others which might be quoted are exceptional, but they were paid for objects of exceptional rarity or quality.

It is not necessary to pursue the chronicle of recent sales, which have become a feature of every season. It is worth mentioning, however, that the Holland sale, in June 1908, realized £138,118 (432 lots), a "record" sum for a collection of pictures mainly by modern artists; and that for the Rodolphe Kann collection (Paris) of pictures and objects of art, including 11 magnificent Rembrandts, Messrs Duveen paid £1,000,000 in 1907. In every direction there has been a tendency to increase prices for really great artistic pieces, even to a sensational extent. The competition has become acute, largely owing to American and German acquisitiveness. The demand for the finest works of art of all descriptions is much greater than the supply. As an illustration of the magnitude of the art sale business it may be mentioned that the "turnover" of one firm in London alone has occasionally exceeded £1,000,000 annually.

BIBLIOGRAPHY.—The chief compilations dealing with art sales in Great Britain are: G. Redford, *Art Sales* (1888); and W. Roberts, *Memorials of Christie's* (1897); whilst other books containing much important matter are W. Buchanan, *Memoirs of Painting*; *The Year's Art* (1880 and each succeeding year); F.S. Robinson, *The Connoisseur*; and L. Soullie, *Les Ventes de tableaux, dessins et objets d'art au XIXe siècle* (chiefly French).

ARTS AND CRAFTS, a comprehensive title for the arts of decorative design and handicraft—all those which, in association with the mother-craft of building (or architecture), go to the making of the house beautiful. Accounts of these will be found under separate headings. "Arts and crafts" are also associated with the movement generally understood as the English revival of decorative art, which began about 1875. The title itself only came into general use when the Arts and Crafts Exhibition Society was founded, and held its first exhibition at the New Gallery, London, in the autumn of 1888, since which time arts and crafts exhibitions have been common all over Great Britain. The idea of forming a society for the purpose of showing contemporary work in design and handicraft really arose out of a movement of revolt or protest against the exclusive view of art encouraged by the Royal Academy exhibitions, in which oil paintings in gilt frames claimed almost exclusive attention—sculpture, architecture and the arts of decorative design being relegated to quite subordinate positions. In 1886, out of a feeling of discontent among artists as to the inadequacy of the Royal Academy exhibitions, considered as representing the art of Great

Britain, a demand arose for a national exhibition to include all the arts of design. One of the points of this demand was for the annual election of the hanging committee by the whole body of artists. After many meetings the group representing the arts and crafts (who belonged to a larger body of artists and craftsmen called the Art-workers' Guild, founded in 1884),[1] perceiving that the painters, especially the leading group of a school not hitherto well represented in the Academy exhibitions, only cherished the hope of forcing certain reforms on the Academy, and were by no means prepared to lose their chances of admission to its privileges, still less to run any risk in the establishment of a really comprehensive national exhibition of art, decided to organize an exhibition themselves in which artists and craftsmen might show their productions, so that contemporary work in decorative art should be displayed to the public on the same footing, and with the same advantages as had hitherto been monopolized by pictorial art. For many years previously there had been great activity in the study and revival in the practice of many of the neglected decorative handicrafts. Amateur societies and classes were in existence, like the Home Arts and Industries Association, which had established village classes in wood-carving, metal work, spinning and weaving, needlework, pottery and basket-work, and the public interest in handicraft was steadily growing. The machine production of an industrial century had laid its iron hands upon what had formerly been the exclusive province of the handicraftsman, who only lingered on in a few obscure trades and in forgotten corners of England for the most part. The ideal of mechanical perfection dominated British workmen, and the factory system, first by extreme division of labour, and then by the further specialization of the workman under machine production, left no room for individual artistic feeling among craftsmen trained and working under such conditions. The demand of the world-market ruled the character and quality of production, and to the few who would seek some humanity, simplicity of construction or artistic feeling in

their domestic decorations and furniture, the only choice was that of the tradesman or salesman, or a plunge into costly and doubtful experiments in original design. From the ’forties onward there had been much research and study of medieval art in England; there had been many able designers, architects and antiquaries, such as the Pugins and Henry Shaw (1800-1873) and later William Burges (1827-1881), William Butterfield (1814-1900) and G.E. Street and others. The school of pre-Raphaelite painters, by their careful and thorough methods, and their sympathy with medieval design, were among the first to turn attention to beauty of design, colour and significance in the accessories of daily life, and artists like D.G. Rossetti, Ford Madox Brown, and W. Holman Hunt themselves designed and painted furniture. The most successful and most practical effort indeed towards the revival of sounder ideas of construction and workmanship may be said to have arisen out of the work of this group of artists, and may be traced to the workshop of William Morris and his associates in Queen Square, London. William Morris, whose name covers so large a field of artistic as well as literary and social work, came well equipped to his task of raising the arts of design and handicraft, of changing the taste of his countrymen from the corrupt and vulgar ostentation of the Second Empire, and its cheap imitations, which prevailed in the ’fifties and ’sixties, and of winning them back, for a time at least, to the massive simplicity of plain oak furniture, or the delicate beauty of inlays of choice woods, or the charm of painted work, the richness and frank colour of formal floral and heraldic pattern in silk textiles and wall-hangings and carpets, the gaiety and freshness of printed cotton, or the romantic splendour of arras tapestry. Both William Morris and his artistic comrade and lifelong friend, Edward Burne-Jones, were no doubt much influenced at the outset by the imaginative insight, the passionate artistic feeling, and the love of medieval romance and colour of Dante Gabriel Rossetti, who remains so remarkable a figure in the great artistic and poetic revival of the latter half of the 19th century. To William

Morris himself, in his artistic career, it was no small advantage to gain the ear of the English public first by his poetry. His verse-craft helped his handicraft, but both lived side by side. The secret of Morris's great influence in the revival was no doubt to be attributed to his way of personally mastering the working details and handling of each craft he took up in turn, as well as to his power of inspiring his helpers and followers. He was painter, designer, scribe, illuminator, wood-engraver, dyer, weaver and finally printer and papermaker, and having mastered these crafts he could effectively direct and criticize the work of others. His own work and that of Burne-Jones were well known to the public, and in high favour long before the Arts and Crafts Exhibition Society was formed, and though largely helped and inspired by the work of these two artists, the aims and objects of the society rather represented those of a younger generation, and were in some measure a fresh development both of the social and the artistic ideas which were represented by Ruskin, Rossetti and Morris, though the society includes men of different schools. Other sources of influence might be named, such as the work of Norman Shaw and Philip Webb in architecture and decoration, of Lewis Day in surface pattern, and William de Morgan in pottery. The demand for the acknowledgment of the personality of each responsible craftsman in a co-operative work was new, and it had direct bearing upon the social and economic conditions of artistic production. The principle, too, of regarding the material, object, method and purpose of a work as essential conditions of its artistic expression, the form and character of which must always be controlled by such conditions, had never before been so emphatically stated, though it practically endorsed the somewhat vague aspirations current for the unity of beauty with utility. Again, a very notable return to extreme simplicity of design in furniture and surface decoration may be remarked; and a certain reserve in the use of colour and ornament, and a love of abstract forms in decoration generally, which are characteristic of later taste. Not less remarkable has been the new

development in the design and workmanship of jewelry, gold- and silversmiths' work, and enamels, with which the names of Alexander Fisher, Henry Wilson, Nelson Dawson and C.R. Ashbee are associated. Among the arts and crafts of design which have blossomed into new life in recent years-and there is hardly one which has not been touched by the new spirit —book-binding must be named as having attained a fresh and tasteful development through the work of Mr Cobden-Sanderson and his pupils. The art and craft of the needle also must not be forgotten, and its progress is a good criterion of taste in design, choice of colour and treatment. The work of Mrs Morris, of Miss Burden (sometime instructress at the Royal School of Art Needlework, which has carried on its work from 1875), of Miss May Morris, of Miss Una Taylor, of Miss Buckle, of Mrs Walter Crane, of Mrs Newbery, besides many other skilled needlewomen, has been frequently exhibited. Good work is often seen in the national competition works of the students of the English art schools, shown at South Kensington in July. The increase of late years in these exhibitions of designs worked out in the actual material for which they were intended is very remarkable, and is an evidence of the spread of the arts and crafts movement (fostered no doubt by the increase of technical schools, especially of the type of the Central School of Arts and Crafts under the Technical Education Board of the London County Council), of which it may be said that if it has not turned all British craftsmen into artists or all British artists into craftsmen, it had done not a little to expand and socialize the idea of art, and (perhaps it is not too much to say) has made the tasteful English house with its furniture and decorations a model for the civilized world.

(W. Cr.)

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1 Whose members, comprehending as they do the principal living designers, architects, painters and craftsmen of all kinds, have played no inconsiderable part in the English revival.

ART SOCIETIES. In banding themselves into societies and associations artists have always been especially remarkable. The fundamental motive of such leaguing together is apparent, for, by the establishment of societies, it becomes possible for the working members of these to hold exhibitions and thereby to obtain some compensation or reward for their labours. With the growth of artistic practice and public interest, however, art societies have been instituted where this primary object is either absent or is allied to others of more general scope. The furtherance of a cult and the specializing of work have also given rise to many new associations in Great Britain, besides the Royal Academy (see ACADEMY, ROYAL). At the outset, therefore, it will be well to mention the leading art societies thus described. The (now Royal) Society of Painters in Water Colours, founded in 1804, and the (now Royal) Society of British Artists (1823), are typical of those societies which exist merely for purposes of holding exhibitions and conferring diplomas of membership. The British Institution (for the encouragement of British artists) was started in 1806 on a plan formed by Sir Thomas Bernard; and in the gallery, erected by Alderman Boydell to exhibit the paintings executed for his edition of Shakespeare, were from time to time exhibited pictures by the old masters, deceased British artists and others, till 1867, when the lease of the premises expired. A fund of £16,200, then in the hands of trustees, had accumulated to £24,610 in 1884. The Artists' Society, formed in 1830, has for its object the providing of facilities to enable its members to perfect themselves in their art. To this end there is a good library of works on art, and abundant opportunities are afforded for general study from the life. In the furtherance of a cult the Japan Society, devoted to the encouragement of the study of the arts and industries of Japan, is a typical example; and the Society of Mezzotint Engravers is representative of those bodies formed in the interests of particular groups of workers. One of the remarkable features in the history of art in Great Britain has been the rapid increase of the artistic rank and file. Taking the number of exhibitors at the principal

London and provincial exhibitions, it is found that in the period 1885-1900 the ranks were doubled. At the end of the 19th century it was estimated that there were quite 7000 practising artists. Coincident with this astonishing development there has been a corresponding addition of new art societies and the enlargement of older bodies. For instance, the membership of the Royal Society of British Artists advanced in the period mentioned from 80 to 150. Similar extensions can be noted in other societies, or in such a case as that of the Royal Institute of Painters in Water Colours, where the membership is limited to 100, it is to be noticed that more space is given to the works of outsiders. But the expansion of older exhibiting societies has not proved sufficient. Portrait painters, pastellists, designers, miniaturists and women artists have felt the necessity of forming separate coteries. Interesting though these movements from within may be, the growth of societies originating in the spirit of altruism associated with such names as Ruskin and Kyrle is equally instructive. Nearly all these are the products of the last quarter of the 19th century, and include the Sunday Society, which in 1896 secured the Sunday opening of the national museums and galleries in the metropolis.

The specializing of study and work has also given rise to much artistic endeavour. For a long time archaeology—British and Egyptian—claimed almost exclusive attention. Latterly the arts of India and Japan have engaged much notice, and societies have been organized to further their study. Finally, bands of workers in particular branches of art have felt the need of clubbing together in order to protect their special interests. A slight suspicion of trade-unionism is attached to some of these; but on the whole the establishment of such bodies as the Society of Illustrators, the Society of Designers, and the Society of Mezzotint Engravers has been with a view to advancing the public knowledge of the merits of these branches of artistic enterprise.

Exhibiting Societies.—(*a*) Old Established. These in London are: The Royal Academy, the Royal Water Colour Society, the Royal Institute of Painters in Water Colours, the Society of Oil Painters, and the Royal Society of British Artists. In the provinces, the Birmingham Royal Society of Artists has been in existence since 1825, and has a life academy with professors attached. (*b*) Modern.—In this category are many which reflect the new spirit which came into artistic life in the last quarter of the 19th century. The New English Art Club, founded in 1885 as a protest against academic art, achieves its purpose by exhibition only. The International Society of Painters and Engravers, again, represents the wider ideas of the 20th century. The Royal Society of Painter-Etchers and Engravers, consisting of fellows and associates, not exceeding 150 in all, conserves the interests of a numerous body of workers, and, in addition to holding exhibitions, confers diplomas (R.E. and A.R.E.) on the exhibitors of meritorious etchings or engravings. The Society of Women Artists (formerly the Society of Lady Artists) is wholly devoted to the display of works by female artists, and in 1891 the Society of Portrait Painters was formed to carry out the object conveyed in its title. Two associations advance the art of the miniature-painter, and the Pastel Society, formed in 1898, holds displays of members' work at the Royal Institute Galleries. In Scotland there is the Royal Scottish Academy. The Royal Scottish Society of Painters in Water Colours (Glasgow) grants the title R.S.W. to its members, and the Society of Scottish Artists (Edinburgh), founded in 1891, has a membership of nearly 500 young artists. Other exhibiting societies which call for mention are: The Yorkshire Union of Artists (Leeds), which consolidates many local societies; the Nottingham Society of Artists, which also encourages drawing from the living model; and the Liverpool Sketching Club, founded in 1870, which holds an annual exhibition.

Societies of Instruction and Popular Encouragement.—It is under this head that the chief evidence of the modern art revival will be found.

First it should be noted that there are very few societies designed for the artistic improvement of artists. The Artists' Society has already been mentioned; and the Art Workers' Guild, which meets at Clifford's Inn Hall, provides meetings, from which the public is excluded, where profitable discussions take place on questions of craft and design. But, as a rule, the art society, of which only artists are members, is organized for exhibition purposes or for the protection of interests. With regard to those societies of popular and educational intention the old Society of Arts in the Adelphi, founded in 1754, enjoys a good record. Numerous lectures on art subjects have from time to time been given, and in 1887 a scheme was devised by which awards are made to student-workers in design. The Society for the Encouragement of the Fine Arts (Conduit Street) has also laboured since its foundation in 1858 to increase a technical knowledge, its members holding conversazioni at various picture galleries. The Artists' and Amateurs' Conversazione, instituted in 1831, which used to meet at the Piccadilly Galleries and is now defunct, carried out a similar plan. Two other societies, now obsolete, should be mentioned whose method were directly educational. The Arundel Society, which for many years promoted the knowledge of art by copying and publishing important works of ancient masters, issued to its members on payment of annual subscriptions, was eventually wound up on the last day of 1897. The Arundel Club, founded in 1904, continues the aim, but with a wider scope, reproducing works of art rendered somewhat inaccessible by being in private collections. The International Chalcographical Society, formed for the study of the early history of engraving, also did useful work. Another association of painters, sculptors, architects and engravers, the Graphic Society, ceased on the 29th of October 1890. This was one of the most interesting of societies, rare works of art being exhibited and discussed at its meetings. A very active educational body, originated in 1888, namely the Royal Drawing Society, has for its definite object the teaching of drawing as a means of education.

The methods of instruction are based on the facts that very young children try to draw before they can write, and that they have very keen perception and retentive memory. The society aims, therefore, at using drawing as a means of developing these innate characteristics of the young, and already nearly 300 important schools follow out its system. Lord Leighton, Sir John Millais, and Sir Edward Burne-Jones took an active part in the society's labours. The Art for Schools Association, founded in 1883, has also done steady work in endeavouring to provide schools with works of art. These are chiefly reproductions of standard works of art or of historical and natural subjects. The wave of enthusiasm aroused by Mr Ruskin's teachings caused Societies of the Rose to be founded in London, Manchester, Sheffield, Birmingham, Aberdeen and Glasgow; but some of these eventually ceased active work, to be revived again, however, by the Ruskin Union, formed in the year of the great writer's death (1900). Most of these societies were formed in 1879; but it should not be forgotten that two years earlier the Kyrle Society was started with the object of bringing the refining and cheering influences of natural and artistic beauty to the homes of the people. Under the presidency of Earl Brownlow, the Home Arts and Industries Association continues a work which was started in 1884, and anticipated much of the present system of technical education. Voluntary teachers organize classes for working people, at which a practical knowledge of art handiwork is taught. Training classes for voluntary teachers are held at the studios at the Albert Hall, as well as an annual exhibition. An interesting type of society has been established in Bolton, Lancashire. Under the title of an Arts Guild the members, numbering over 200, devote themselves to the advancement of taste in municipal improvements.

Societies of Special Study, Practice and Protection.—Under this head should be placed those associations which affect a cult, or are composed of particular workers, or which protect public or private interests.

Perhaps the chief of the first kind is the Japan Society, which, since its inception in 1892, has been joined by over 1350 members interested in matters relating to Japanese art and industries. The Dürer Society, formed in 1897, has for its main object the reproduction of works by Albrecht Dürer, and his German and Italian contemporaries. The Vasari Society, founded in 1905, works in harmony with the Arundel Club and the Dürer Society, reproducing drawings by the Old Masters. In this category of special study may also be placed the Society for the Encouragement and Preservation of Indian Art, the Egypt Exploration Fund, and the Society for the Promotion of Hellenic Studies. Of the societies of special practice it has already been noticed that some are purely exhibiting associations, such as the Portrait Painters, the Pastel Society, and the two miniature bodies. The formation of the Society of Mezzotint Engravers in 1898 is an example of the leaguing together of particular workers to call attention to their interests. Original and translator engravers, together with collectors and connoisseurs, comprise the membership. The decaying art of wood engraving is also fostered by the International Society of Wood Engravers, and the Society of Designers, founded in 1896, safeguards the interests of professional designers for applied art, without holding exhibitions. Special practice and protection are also considered by the Society of Illustrators, composed of artists who work in black and white for the illustrated press. This society was inaugurated in 1894, and fifteen of the members of the committee must be active workers in illustration. As an instance of the tendency of art workers to combine, the Society of Art Masters is a good illustration. This is an association of teachers of art schools, controlled by the art branch of the Board of Education, and has a membership of over 300. Good work of another kind occupies the National Trust for Places of Historic Interest or Natural Beauty. The council of the Trust includes representatives of such bodies as the National Gallery, the Royal Academy, the Royal Society of Painters in Water Colours, the Society of Antiquaries, the Royal Institute of

British Architects, the Universities, Kyrle Society, Society for the Protection of Ancient Buildings and the Selborne Society.

FOREIGN ART SOCIETIES.—The following are brief particulars of the chief art societies elsewhere than in Great Britain:—

AUSTRIA.—Vienna, *Vereinigung bildender Künstler Österreichs* (Society of Austrian Painters) and the *Wiener Künstlergenossenschaft* (Association of Viennese Artists).

BELGIUM.—Brussels, *Société des beaux-arts*, the *Libre Esthétique*, *Société des aquarellistes et pastellistes*, *Société royale beige des aquarellistes*, and numerous private societies (*cercles*) in Brussels, Antwerp, Liége, Ghent and other cities.

FRANCE.—Paris, the *Société des artistes français* (The Salon), *Société nationale des beaux-arts* (The New Salon), *Société des aquarellistes*. Exhibiting societies are the *Société des artistes indépendants*, *Société des orientalistes*, and *Salon des pastellistes*.

GERMANY.—The small local societies are affiliated to one large parent body, the *Deutsche Künstlergenossenschaft*, in Berlin under the presidency of Anton von Werner. The *Deutsche Illustratorenverband* watches over the interests of illustrators and designers. In Münich there are two bodies—the *Künstlergenossenschaft* (old society of artists), holding its exhibitions in the Glaspalast, and the *Verein bildender Künstler*, the Secessionists.

ITALY.—Four exhibiting societies: Rome, *Società in Arte Libertas*, *Scuola degli Aquarellisti*; Milan, *Famiglia Artistica*, *Società degli Artiste*; Florence, *Circolo Artistico*; Naples, *Instituti di Belli Arti.*

PORTUGAL.—*Sociedade promotora das Bellas-Artes* and *Gremio Artistico*.

Russia.—There is no exclusively art society of importance, but there is at St Petersburg the *Société littéraire et artistique*.

Spain.—Madrid, *L'Association des artistes espagnols*.

Sweden.—Stockholm, *Svenska Konstuareruas Forening*.

Switzerland.—Berne, *La Société des peintres et sculpteurs suisses*.

United States.—New York, National Academy of Design, American Water Color Society, and National Sculpture Society.

(A. C. R. C.)

ART TEACHING. It is the tendency of all departments of the human mind to outgrow their original limits. Traditions of teaching are long-lived, especially in art, and new ideas only slowly displace the old, so that art teaching as a whole is seldom abreast of the ideas and practice of the more advanced artists. The old academic system adapted to the methods and aims in art in the 18th century, which has been carried on in the principal art schools of Great Britain with but slight changes of method, consisted chiefly of a course of drawing from casts of antique statues in outline, and in light and shade without backgrounds, of anatomical drawings, perspective, and drawing and painting from the living model. Such a training seems to be more or less a response to Lessing's definition of painting as "the imitation of solid bodies upon a plane surface." It seems to have been influenced more by the sculptor's art than any other. Indeed, the academic teaching from the time of the Italian Renaissance was no doubt principally derived from the study of antique sculpture; the proportions of

the figure, the style, pose, and sentiment being all taken from Graeco-Roman and Roman sculptures, discovered so abundantly in Italy from the 16th century onwards. As British ideas of art were principally derived from Italy, British academics endeavoured to follow the methods of teaching in vogue there in later times, and so the art student in Great Britain has had his intention and efforts directed almost exclusively to the representations of the abstract human form in abstract relief. Traditions in art, however, may sometimes prove helpful and beneficial, and preservative of beauty and character, as in the case of certain decorative and constructive arts and handicrafts in common use, such as those of the rural waggon-maker and wheelwright, and horse-harness maker.

Some schools of painting, sculpture and architecture have preserved fine and noble traditions which yet allowed for individuality. Such traditions may be said to have been characteristic of the art of the middle ages. It often happens, too, when many streams of artistic influence meet, there may be a certain domination or ascendancy of the traditions of one art over the others, which is injurious in its effects on those arts and diverts them from their true path. The domination of individualistic painting and sculpture over the arts of design during the last century or two is a case in point.

With the awakening of interest in industrial art—sharply separated by pedantic classification from fine art—which began in England about the middle of the 19th century, schools of design were established which included more varied studies. Even as early as 1836 a government grant was made towards the opening of public galleries and the establishment of a normal school of design with a museum and lectures, and in 1837 the first school of design was opened at Somerset House. In 1840 grants were made to establish schools of the same kind in provincial towns, such as Manchester, Birmingham, Glasgow, Leeds and Paisley. The names of G. Wallis in 1847, and Ambrose Poynter in 1850, are associated with schemes

of art instruction adopted in the government art schools, and the year 1851, the year of the Great Exhibition, was also marked by the first public exhibition of students' works, and the first institution of prizes and scholarships. In 1852 "the Department of Practical Art" was constituted, and a museum of objects collected at Marlborough House which afterwards formed the nucleus of the future museum at South Kensington. In 1853 "the Department of Science and Art" was established, and in 1857, under the auspices of Henry Cole, the offices of the department and the National Art Training School were removed from Marlborough House to South Kensington. Classes for instruction in various crafts had been carried on both at Somerset House and Marlborough House, and the whole object of the government schools of design was to give an artistic training to the designer and craftsman, so that he could carry back to his trade or craft improved taste and skill. The schools, however, became largely filled by students of another type—leisured amateurs who sought to acquire some artistic accomplishment, and even in the case of genuine designers and craftsmen who developed pictorial skill in their studies, the attraction and superior social distinction and possibility of superior commercial value accruing to the career of a painter of easel pictures diverted the schools from their original purpose.

For some time after the removal to South Kensington, during the progress of the new buildings, and under the direction of Godfrey Sykes and F.W. Moody, practical decorative work both in modelling and painting was carried out in the National Art Training School; but on the completion of these works, the school relapsed into a more or less academic school on the ordinary lines, and was regarded chiefly as a school for the training of art teachers and masters who were required to pass through certain stereotyped courses and execute a certain series of drawings in order to obtain their certificates. Thus model-drawing, freehand outline, plant-drawing in outline, outline from the cast, light and shade from the cast,

drawing of the antique figure, still life, anatomical drawings, drawing and painting from the life, ornamental design, historic studies of ornament, perspective and geometry, were all taken up in a cut-and-dried way, as isolated studies, and with a view solely to obtaining the certificate or passing an examination. This theoretic kind of training, though still in force, and though it enabled the department to turn out certificated teachers for the schools of the country of a certain standard, and to give to students a general theoretic idea of art, has been found wanting, since, in practice, when the student in design leaves his school and desires to take up practical work as a designer or craftsman, he requires *special* knowledge, and specialized skill in design for his work to be of use; and though he may be able to impart to others what he himself has laboriously acquired, the theoretic and general character of his training proves of little or no use, face to face with the ever shifting and changing demands of the modern manufacturer and the modern market.

A growing conviction of the inadequacy of the schools of the Science and Art Department (now the Board of Education), considered as training grounds for practical designers and craftsmen, led to the establishment of new technical schools in the principal towns of Great Britain. The circumstance of certain large sums, diverted from their original purpose of compensation to brewers, being available for educational purposes and at the disposal of the county councils and municipal bodies, provided the means for the building and equipment of these new technical schools, which in many cases are under the same roof as the art school in the provincial towns, and, since the Education Act of 1902, are generally rate-supported. The art schools formerly managed by private committees and supported by private donors, assisted by the government grants, are now, in the principal industrial towns of Great Britain, taken over by the municipality. Birmingham is singularly well organized in this respect, and its art school has long held a leading position. The school is well housed in

a new building with class-rooms with every appliance, not only for the drawing, designing and modelling side, but also for the practice of artistic handicrafts such as metal repoussé, enamelling, wood-carving, embroidery, &c. The municipality have also established a jewelry school, so as to associate the practical study of art with local industry. Manchester and other cities are also equipped with well-organized art schools.

The important change involved in the incorporation of the Science and Art Department with the Board of Education also led to a reorganization of the Royal College of Art. A special council of advice on art matters was appointed, consisting of representatives of painting, sculpture, architecture and design, who deal with the Royal College of Art, and appoint the professors who control the teaching in the classes for architecture, design and handicraft, decorative painting and sculpture, modelling and carving. The council decide upon the curriculum, and examine and criticize the work of the college from time to time. They also advise the board in regard to the syllabus issued to the art schools of the country, and act as referees in regard to purchases for the museum.

Of other institutions for the teaching of art, the following may be named: The Royal Drawing Society of Great Britain and Ireland, which was formed principally to promote the teaching of drawing in schools as a means of education. The system therein adopted differs from the ordinary drawing courses, and favours the use of the brush. Brushwork has generally been adopted for elementary work, too, by London County Council teachers, drawing being now a compulsory subject. Remarkable results have been obtained by the Alma Road Council schools in the teaching of boys from eight to twelve by giving them spaces to fill with given forms—leaf shapes—from which patterns are constructed to fill the spaces, brush and water-colour being the means employed. At the Royal Female School of Art in Queen Square, London, classes in drawing and painting from life are held,

and decorative design is also studied. There are also the Royal School of Art Needlework and the School of Art Wood-carving, all aided by the London County Council. The City and Guilds of London Institute has two departments for what is termed “applied” art, one at the South London School of Technical Art, and the other at the Art Department in the Technical College, Finsbury. The Slade School of Drawing, Painting and Sculpture, University College, Gower Street, confines itself to drawing and painting from the antique and life, and exercise in pictorial composition. There are also lectures on anatomy and perspective. The Slade professorships at Oxford and Cambridge universities are concerned with the teaching and literature of art, but they do not concern themselves with the practice. There are also, in addition to the schools of art named and those in connexion with the Board of Education and the London County Council in the various districts of London, many and various private clubs and schools, such as the Langham and “Heatherley’s,” chiefly concerned in encouraging drawing and painting from the life, and for the study of art from the pictorial point of view, or for the preparation of candidates for the Royal Academy or other schools. The polytechnics and technical institutes also provide instruction in a great variety of artistic crafts.

A general survey, therefore, of the various institutions which are established for the teaching of art in Great Britain gives the impression that the study of art is not neglected, although, perhaps, further inquiry might show that, compared with the great educational establishments, the proportion is not excessive. Now that the Education Act 1902 has given the county councils control of elementary and secondary education and charged them with the task of promoting the co-ordination of all forms of education in consultation with the Board of Education, it is probable that an elementary scholar who shows artistic ability will be enabled to pass on from the elementary classes in one school to the higher art and technical

schools, secondary and advanced, without retracing his steps, thus escaping the depression of going over old ground.

The general movement of revival of interest in the arts of decorative design and the allied handicrafts, with the desire to re-establish their influence in art-teaching, has been due to many causes, among which the work of the Arts and Crafts Exhibition Society may count as important. From the leading members of this body the London County Council Technical Educational Board, when it was face to face with the problem of organizing its new schools and its technical classes, sought advice and aid. Success has attended their schools, especially the Central School of Arts and Crafts at Morley Hall, Regent Street. The object of the school is to provide the craftsman in the various branches of decorative design with such means of improving his taste and skill as the workshop does not afford. It does not concern itself with the amateur or with theoretic drawing. The main difference in principle adopted in this school in the teaching of design is the absence of teaching design *apart from handicraft.* It is considered that a craftsman thoroughly acquainted with the natural capacities of his material and strictly understanding the conditions of his work, would be able, if he had any feeling or invention, to design appropriately in that material, and no designing can be good apart from a knowledge of the material in which it is intended to be carried out. It should be remembered, too, that graphic skill in representing the appearances of natural objects is one sort of skill, and the executive skill of the craftsman in working out his design, say in wood or metal, is quite another. It follows that the works of drawing or design made by the craftsman would be of quite a different character from a pictorial drawing, and might be quite simple and abstract, while clear and accurate. The training for the pictorial artist and for the craftsman would, therefore, naturally be different.

The character of the art-teaching adopted in any country must of course depend upon the dominant conception of art and its function and purpose. If we regard it as an idle accomplishment for the leisured few, its methods will be amateurish and superficial. If we regard art as an important factor in education, as a language of the intelligence, as an indispensable companion to literature, we shall favour systematic study and a training in the power of direct expression by means of line. We shall value the symbolic drawing of early civilizations like the Egyptian, and symbolic art generally, and in the history of decorative art we shall find the true accompaniment and illustration of human history itself. From this point of view we shall value the acquisition of the power of drawing for the purpose of presenting and explaining the facts and forms of nature. Drawing will be the most direct means at the command of the teacher to explain, to expound, to demonstrate where mere words are not sufficiently definite or explicit. Drawing in this sense is taking a more important place in education, especially in primary education, though there is no need for it to stop there, and one feels it may be destined to take a more important position both as a training for the eye and hand and an aid to the teacher. Then, again, we may regard art more from its social aspect as an essential accompaniment of human life, not only for its illustrative and depicting powers, but also and no less for its pleasure-giving properties, its power of awakening and stimulating the observation and sympathy with the moods of nature, its power of touching the emotions, and above all of appealing to our sense of beauty. We shall regard the study of art from this point of view as the greatest civilizer, the most permeating of social and human forces. Such ideas as these, shared no doubt by all who take pleasure and interest in art, or feel it to be an important element in their lives, are crossed and often obscured by a multitude of mundane considerations, and it is probably out of the struggle for ascendancy between these that our systems of art teaching are evolved. There is the demand of the right to live on the part of the artist and the

teacher of art. There is the demand on the part of the manufacturer and salesman for such art as will help him to dispose of his goods. In the present commercial rivalry between nations this latter demand is brought into prominent relief, and art is apt to be made a minister, or perhaps a slave to the market. These are but accidental relationships with art. All who care for art value it as a means of expression, and for the pleasure and beauty it infuses into all it touches, or as essential and inseparable from life itself. Seeing then the importance of art from any point of view, individual, social, commercial, intellectual, emotional, economic, it should be important to us in our systems of art-teaching not to lose sight of the end in arranging the means—not to allow our teaching to be dominated by either dilettantism or commercialism, neither to be feeble for want of technical skill, nor to sacrifice everything to technique. The true object of art-teaching is very much like that of all education—to inform the mind, while you give skill to the hand—not to impose certain rigid rules, or fixed recipes and methods of work, but while giving instruction in definite methods and the use of materials, to allow for the individual development of the student and enable him to acquire the power to express himself through different media without forgetting the grammar and alphabet of design. Practice may vary, but principles remain, and there is a certain logic in art, as well as in reasoning. All art is conditioned in the mode of its expression by its material, and even the most individual kind of art has a convention of its own by the very necessities and means of its existence. Methods of expression, conventions alter as each artist, each age seeks some new interpretation of nature and the imagination—the well-springs of artistic life, and from these reviving streams continually flow new harmonies, new inventions and recombinations, taking form and colour according to the temperaments which give them birth.

(W. Cr.)

ARTUSI, GIOVANNI MARIA, Italian composer and musical theorist, was born in Bologna, and died on the 18th of August 1613. He was *canonico regulare* at the church of San Salvatore in his native city. He is chiefly famous in the history of music for his attacks upon Monteverde (*q.v.*) embodied in his *L'Artusi overo d. imp.* (1600). For an exhaustive explanation and a translation of excerpts from these the studies of Dr G. Vogel and O. Riemann should be consulted. These will be found in the *Vierteljahrsschrift für Musikwissenschaft*, Leipzig, vol. 3, pp. 326, 380 and 426.

ARU ISLANDS (Dutch *Aroe*), a group in the residency of Amboyna, Dutch East Indies; between 5° 18′ and 7° 5′ S., and 134° and 135° E.; the member nearest to the south-west coast of New Guinea lying about 70 m. from it. The larger islands (Wokan, Kobrur, Maikor and Trangan), and certain of the lesser ones, are regarded by the Malays as one land mass which they call *tana besar* ("great land"). This is justified inasmuch as its parts are only isolated by narrow creeks of curious form, having the character of rivers. The smaller islands number some eighty; the total land area is 3244 sq. m.; and the population about 22,000. The islands are low, but it is only on the coast that the ground is swampy. The principal formation is coralline limestone; the eastern coast is defended by coral reefs, and the neighbouring sea (extending as far as New Guinea, and thus demonstrating a physical connexion with that land) is shallow, and abounds in coral in full growth. A large part of the surface is covered with virgin forest, consisting of screw-pines, palm trees, tree ferns, canariums, &c. The

fauna is altogether Papuan. The natives are also Papuans, but of mixed blood. They are divided into two confederations, the Uli-luna and the Uli-sawa, which are hostile to each other. The houses are remarkable as being built on piles sunk in the solid rock and having two rooms, the one surrounding the other. The people are in manners complete savages. The natives are governed by rajas (*orang kajas*), the Dutch government being represented by a *posthouder.* In the interior is said to exist a tribe—the Korongoeis—with white skins and fair hair, but it has never been seen by travellers. A few villages are nominally Christian, and the Malays have introduced Mahommedanism, but most of the natives have no religion. Dobbo, on a small western island, is the chief place; its resident population is reinforced annually, at the time of the west monsoon, by traders from that quarter, who deal in the tripang, pearl shell, tortoise-shell, and other produce of the islands.

ARUNDEL, EARLDOM OF. This historic dignity, the premier earldom of England, is popularly but erroneously supposed to be annexed to the possession of Arundel Castle. Norman earls were earls of counties, though sometimes styled from their chief residence or from the county town, and Mr J.H. Round has shown that the earldom of "Arundel" was really that of Sussex. Its origin was the grant by Henry I. to his second wife, in dower, of the forfeited "honour" of Arundel, of which the castle was the head, and which comprised a large portion of Sussex. After his death she married William "de Albini" (*i.e.* d'Aubigny), who from about the year 1141 is variously styled earl of Sussex, of Chichester, or of Arundel, or even Earl

William “de Albini.” His first known appearance as earl is at Christmas 1141, and it has been ascertained that, after acquiring the castle by marriage, he had not thereby become an earl. Henry II., on his accession, “gave” him the castle and honour of Arundel, in fee, together with “the third penny of the pleas of Sussex, of which he is earl.” His male line of heirs became extinct on the death of Hugh “de Albini,” earl of Arundel, in 1243, who had four sisters and co-heirs. In the partition of his estates, the castle and honour of Arundel were assigned to his second sister’s son, John Fitzalan of a Breton house, from which sprang also the royal house of Stuart. It is proved, however, by record evidence, that neither John nor his son and successor were ever earls; but from about the end of 1289, when his grandson Richard came of age, he is styled earl of Arundel. Richard’s son Edmund was forfeited and beheaded in 1326, and Arundel was out of possession of the family till 1331, when his son was restored, and regained the castle and also the earldom by separate grants. Both were again lost in 1397 on his son being beheaded and attainted. But the latter’s son was restored to both the earldom and the estates by Henry IV. in 1400. He died without issue in 1415.

The castle and estates now passed to the late earl’s cousin and heir-male under a family entail, but the representation in blood of the late earl passed to his sisters and co-heirs, of whom the eldest had married Thomas Mowbray, duke of Norfolk. The descent of the earldom remained in doubt, till the heir-male’s son and heir successfully claimed it in 1433, in virtue of his tenure of the castle, alleging that it was “a dignity or name united and annexed to the castle and lordship of Arundel for time whereof memory of man was not to the contrary.” His claim was opposed on behalf of the Mowbrays, and the allegation on which it was based is discussed and refuted at great length in the *Lords’ Reports on the Dignity of a Peer* (i. 404-429). In the descendants of his brother the earldom remained vested till 1580, when the last Fitzalan earl died, leaving as his sole heir his daughter’s

son Philip Howard, whose father Thomas, duke of Norfolk, had been beheaded and attainted in 1572.

Philip, who was through his father senior representative of the earls of Arundel down to 1415, and through his mother sole representative of the subsequent earls, was summoned to parliament as earl in January 1581, but was attainted in 1589. His son Thomas was restored to the earldom and certain other honours in 1604, and, in 1627, obtained an act of parliament "concerning the title, name and dignity of Earl of Arundel, and for the annexing of the Castle, Honour, Manor and Lordship of Arundel ... with the titles and dignities of the Baronies of Fitzalan, Clun and Oswaldestre, and Maltravers, ... to the same title, name and dignity of Earl of Arundel." This act, which was based on the earl's allegation that the title had been "invariably used and enjoyed" by the owners of the castle, "and by reason of the said inheritance and seisin," has been much discussed, especially in the *Lords' Reports* (i. 430-434). There is no doubt that the earl's object was to entail the earldom and the castle strictly on a certain line of heirs, and this was effected by elaborate remainders (passing over the Howards, earls of Suffolk). It is under this act of parliament that the earldom has been held ever since, and that it passed with the castle in 1777 to the heir-male of the Howards, although the representation in blood then passed to heirs general. Thus the castle and the earldom cannot be alienated from the line of heirs on whom it is entailed by the act of 1627; while the heirship in blood of the earlier earls (to 1415) is vested in Lords Mowbray and Petre and the Baroness Berkeley, and that of the later earls (to 1777) in Lords Mowbray and Petre.

The precedence of the earldom was challenged in 1446 by Thomas Courtenay, earl of Devon, owing to the question as to its descent spoken of above, but the king in council confirmed to the earl the precedence of his ancestors "by reason of the Castle, Honour and Lordship of Arundel." In the

act of 1627 the "places" and "pre-eminences" belonging to the earldom were secured to it. It would appear, however, that the decision of the dispute with the earl of Devon in 1446 restricts that precedency to such as the earl's ancestors had enjoyed, if indeed it goes farther than to guarantee his precedence over the earl of Devon. But as there is no other existing earldom older than that of Shrewsbury (1442), the present position of Arundel as the premier earldom is beyond dispute.

See *Lords' Reports on the Dignity of a Peer*; Dugdale's *Baronage*; Tierney's *History of Arundel*; G.E. C[okayne]'s *Complete Peerage*; Round's *Geoffrey de Mandeville*; Pike's *Constitutional History of the House of Lords*.

(J. H. R.)

ARUNDEL, EARLS OF. According to Cokayne (*Complete Peerage*, i. p. 138, note *a*) there is an old Sussex tradition to the effect that

"Since William rose and Harold fell
There have been earls of Arundel."

This, he adds, "is the case if for 'of' we read 'at.'" The questions involved in this distinction are discussed in the preceding article on the earldom of Arundel, now held by the duke of Norfolk. The present article is confined to a biographical sketch of the more conspicuous earls of Arundel, first in the Fitzalan line, and then in the Howard line.

RICHARD FITZALAN (1267-1302), earl of Arundel, was a son of John, lord of Arundel (1246-1272), and a grandson of another John, lord of Arundel, Clun and Oswaldestre (Oswestry), who took a prominent, if somewhat wavering, part in the troubles during the reign of Henry III., and who died in November 1267. Richard, who was called earl of Arundel about 1289, fought for Edward I. in France and in Scotland, and died on the 9th of March 1302.

He was succeeded by his son, EDMUND (1285-1326), who married Alice, sister of John, earl de Warenne. A bitter enemy of Piers Gaveston, Arundel was one of the ordainers appointed in 1310; he declined to march with Edward II. to Bannockburn, and after the king's humiliation he was closely associated with Thomas, earl of Lancaster, until about 1321, when he became connected with the Despensers and sided with the king. He was faithful to Edward to the last, and was executed at Hereford by the partisans of Queen Isabella on the 17th of November 1326.

His son, RICHARD (*c.* 1307-1376), who obtained his father's earldom and lands in 1331, was a soldier of renown and a faithful servant of Edward III. He was present at the battle of Sluys and at the siege of Tournai in 1340; he led one of the divisions of the English army at Creçy and took part in the siege of Calais; and he fought in the naval battle with the Spaniards off Winchelsea in August 1350. Moreover, he was often employed by Edward on diplomatic business. Soon after 1347 Arundel inherited the estates of his uncle John, earl de Warenne, and in 1361 he assumed the title of earl de Warenne or earl of Surrey. He was regent of England in 1355, and died on the 24th of January 1376, leaving three sons, the youngest of whom, Thomas, became archbishop of Canterbury.

Richard's eldest son, RICHARD, earl of Arundel and Surrey (*c.* 1346-1397), was a member of the royal council during the minority of Richard II., and about 1381 was made one of the young king's governors. As

admiral of the west and south he saw a good deal of service on the sea, but without earning any marked distinction except in 1387 when he gained a victory over the French and their allies off Margate. About 1385 the earl joined the baronial party led by the king's uncle, Thomas of Woodstock, duke of Gloucester, and in 1386 was a member of the commission appointed to regulate the kingdom and the royal household. Then came Richard's rash but futile attempt to arrest Arundel, which was the signal for the outbreak of hostilities. The Gloucester faction quickly gained the upper hand, and the earl was one, and perhaps the most bitter, of the lords appellant. He was again a member of the royal council, and was involved in a quarrel with John of Gaunt, duke of Lancaster, whom he accused in the parliament of 1394. After a personal altercation with the king at Westminster in the same year Arundel underwent a short imprisonment, and in 1397 came the final episode of his life. Suspicious of Richard he refused the royal invitation to a banquet, but his party had broken up, and he was persuaded by his brother, Thomas Arundel, archbishop of Canterbury, to surrender himself and to trust to the king's clemency. At once he was tried, was attainted and sentenced to death, and, bearing himself with great intrepidity, was beheaded on the 21st of September 1397. He was twice married and had three sons and four daughters. The earl founded a hospital at Arundel, and his tomb in the church of the Augustinian Friars, Broad Street, London, was long a place of pilgrimage.

His only surviving son, THOMAS (1381-1415), was a ward of John Holand, duke of Exeter, from whose keeping he escaped about 1398 and joined his uncle, Archbishop Thomas Arundel, at Utrecht, returning to England with Henry of Lancaster, afterwards King Henry IV., in 1399. After Henry's coronation he was restored to his father's titles and estates, and was employed in fighting against various rebels in Wales and in the north of England. Having left the side of his uncle, the archbishop, Arundel joined the party of the Beauforts, and was one of the leaders of the English army

which went to France in 1411; then after a period of retirement he became lord treasurer on the accession of Henry V. From the siege of Harfleur he returned ill to England and died on the 13th of October 1415. His wife was Beatrix (d. 1439), a natural daughter of John I., king of Portugal, but he left no children, and the lordship of Arundel passed to a kinsman, JOHN FITZALAN, Lord Maltravers (1385-1421), who was summoned as earl of Arundel in 1416.

John's son, JOHN (1408-1435), did not secure the earldom until 1433, when as the "English Achilles" he had already won great distinction in the French wars. He was created duke of Touraine, and continued to serve Henry VI. in the field until his death at Beauvais from the effects of a wound on the 12th of June 1435. The earl's only son, Humphrey, died in April 1438, when the earldom passed to John's brother, WILLIAM (1417-1488).

HENRY FITZALAN, 12th earl of Arundel (*c.* 1517-1580), son of William, 11th earl, by Anne, daughter of Henry Percy, 4th earl of Northumberland, was born about 1517. He entered King Henry's household, attending the latter to Calais in 1532. In 1533 he was summoned to parliament in his father's barony of Maltravers, and in 1540 he was made deputy of Calais, where his vigorous administration was much praised. He returned to England in April 1544 after the death of his father, and was made a knight of the Garter. In July of the same year he commanded with Suffolk the English expedition to France as lord marshal, and besieged and took Boulogne. On his return to England he was made lord chamberlain, an office which he retained after the accession in 1547 of Edward VI., at whose coronation he acted as high constable. He was one of the twelve counsellors nominated in Henry VIII.'s will to assist the executors, but he had little power during the protectorship of Somerset or the ascendancy of Warwick (afterwards duke of Northumberland), and in 1550 by the latter's

device he was accused of embezzlement, removed from the council, confined to his house, and fined £12,000—£8000 of this sum being afterwards remitted and the charges never being proved. Subsequently he allied himself with Somerset, and was implicated in 1551 in the latter's plot against Northumberland, being imprisoned in the Tower in November. On the 3rd of December 1552, though he had never been brought to trial, he signed a submission and confession before the privy council, and was liberated after having been again heavily fined. As Edward's reign drew to its close, Arundel's support was desired by Northumberland to further his designs on the throne for his family, and he was accordingly reinstated in the council and discharged of his fine. In June 1553 he opposed Edward's "device" for the succession, which passed over his sisters Mary and Elizabeth as illegitimate, and left the crown to the children of the duchess of Suffolk, and alone of the council refused the "engagement" to support it, though he signed the letters patent. On the death of Edward (July 6, 1553) he ostensibly joined in furthering the duke's plans, but secretly took measures to destroy them, and according to some accounts sent a letter to Mary the same evening informing her of Edward's death and advising her to retreat to a place of security. Meanwhile he continued to attend the meetings of the council, signed the letter to Mary declaring her illegitimacy and Lady Jane Grey's right to the throne, accompanied Northumberland to announce to Jane her accession, and urged Northumberland to leave London and place himself at the head of the forces to attack Mary, wishing him God-speed on his departure. In Northumberland's absence, he gained over his fellow-councillors, and having succeeded with them in getting out of the Tower, called an assembly of the corporation and chief men of the city, denounced Northumberland, and had Mary proclaimed queen, subsequently riding off to join her with the Great Seal at Framlingham. On the 20th of July he secured Northumberland at Cambridge, and returned in triumph with Mary to London on the 3rd of August, riding before her with

the sword of state. He was now made a privy councillor and lord steward, and was granted several favours and privileges, acting as high constable at the coronation, and obtaining the right to create sixty knights. He took a prominent part in various public acts of the reign, was a commissioner to treat for the queen's marriage, presided at the trial of the duke of Suffolk, assisted in suppressing Wyatt's rebellion in 1554, was despatched on foreign missions, and in September 1555 accompanied Philip to Brussels. The same year he received, together with other persons, a charter under the name of the Merchant Adventurers of England, for the discovery of unknown lands, and was made high steward of Oxford University, being chosen chancellor in 1559, but resigning his office in the same year. In 1557, on the prospect of the war with France, he was appointed lieutenant-general of the forces for the defence of the country, and in 1558 attended the conference at the abbey of Cercamp for the negotiation of a peace. He returned to England on the death of Mary in November 1558, and is described to Philip II. at that time as "going about in high glee, very smart" and with hopes of marrying the queen, but as "flighty" and of "small ability." He was reinstated in all his offices by Elizabeth, served as high constable at her coronation, and was visited several times by the queen at Nonsuch in Surrey. As a Roman Catholic he violently opposed the arrest of his co-religionists and the war with Scotland, and in 1560 came to blows with Lord Clinton in the queen's presence on a dispute arising on those questions. He incurred the queen's displeasure in 1562 by holding a meeting at his house during her illness to consider the question of the succession and promote the claims of Lady Catherine Grey. In 1564, being suspected of intrigues against the government, he was dismissed from the lord-stewardship and confined to his house, but was restored to favour in December. In March 1566 he went to Padua, but being summoned back by the queen he returned to London accompanied by a large cavalcade on the 17th of April 1567. Next year he served on the commission of inquiry into

the charges against Mary, queen of Scots. Subsequently he furthered the marriage of Mary with the duke of Norfolk, his son-in-law, together with the restoration of the Roman Catholic religion and government, and deposition of Elizabeth, in collusion with Spain. He made use of the incident in 1568, of the seizure of treasure at Southampton intended for Philip, as a means of effecting Cecil's overthrow, and urged upon the Spanish government the stoppage of trade. He is described in 1569 to Philip as having "good intentions," "whilst benefiting himself as he was very needy." In January he alarmed Elizabeth by communicating to her a supposed Spanish project for aiding Mary and replacing her on her throne, and put before the queen in writing his own objections to the adoption of extreme measures against her. In June he received with Norfolk and Lumley 6000 crowns from Philip. In September, on the discovery of Norfolk's plot, he was arrested, but not having committed himself sufficiently to incur the charge of treason in the northern rebellion he escaped punishment, was released in March 1570, and was recalled by Leicester to the council with the aim of embarrassing Cecil. He again renewed his treasonable intrigues, which were at length to some extent exposed by the discovery of the Ridolfi plot in September 1571. He was once more arrested, and not liberated till December 1572 after Norfolk's execution. He died on the 24th of February 1580, and was buried in the chapel at Arundel, where a monument was erected to his memory.

He married (1) Catherine, daughter of Thomas Grey, 2nd marquess of Dorset, by whom he had Henry, who predeceased him, and two daughters, of whom Mary married Thomas Howard, 4th duke of Norfolk; and (2) Mary, daughter of Sir John Arundell and dowager countess of Sussex, by whom he had no children. Arundel was the last earl of his family, the title at his death passing through his daughter Mary to the Howards.

AUTHORITIES.—MS. Life by a contemporary in *Royal MSS.*, British Museum, 17 A ix., printed with notes in *Gent. Mag.* (1833)(ii.), pp. 11, 118, 210, 490; M.A. Tierney, *Hist. of Arundel*, p. 319; *Chronicle of Queen Jane* (Camden Soc. 1850); *Literary Remains of Edward VI.* (Roxburghe Club, 1857); J. Nichols, *Progresses of Queen Elizabeth* (1823), i. 74; Wood, *Fasti Oxon.* (Bliss), i. 153, 156; *Cal. State Papers, Simancas*, i. 18, ii. 152, &c., *Notes and Queries*, 2 Ser. iv. 84, &c.

PHILIP HOWARD, 1st earl[1] of Arundel (1557-1595), eldest son of Thomas Howard, 4th duke of Norfolk, executed for high treason in 1572, and of Lady Mary, daughter and heiress of Henry Fitzalan, 12th earl of Arundel, was born on the 28th of June 1557. He was married in 1571 to Anne, daughter and co-heiress of Thomas Dacre, Lord Dacre (1566), and was educated at Cambridge, being accorded the degree of M.A. in 1576. Subsequently Lord Surrey, as he was styled, came to court, partook in its extravagant gaieties and dissipations, and kept his wife in the background; but he nevertheless failed to secure the favour of Elizabeth, who suspected the Howards generally. On the death of his maternal grandfather in February 1580 he became earl of Arundel and retired from the court. In 1582 his wife joined the church of Rome, and was committed to the charge of Sir Thomas Shirley by the queen. He was himself suspected of disloyalty, and was regarded by the discontented Roman Catholics as the centre of the plots against the queen's government, and even as a possible successor. In 1583 he was with some reason suspected of complicity in Throgmorton's plot and prepared to escape to Flanders, but his plans were interrupted by a visit from Elizabeth at his house in London, and by her order subsequently to confine himself there. In September 1584 he became a Roman Catholic, dissembling his conversion and attempting next year once more to escape abroad; but having been brought back he was placed in the Tower on the 25th of April 1585, and charged before the Star Chamber with being a Romanist, with quitting England without leave, sharing in Jesuit plots, and

claiming the dukedom of Norfolk. He was sentenced to pay £10,000 and to be imprisoned during the queen's pleasure. In July 1586 his liberty was offered to him if he would carry the sword of state before the queen to church. In 1588 he was accused of praying, together with other Romanists, for the success of the Spanish Armada. He was tried for high treason on the 14th of April 1589, found guilty and condemned to death; but lingered in confinement under his sentence, which was never executed, till his death on the 19th of October 1595. He was buried in the Tower, whence his remains were removed in 1624 to Arundel. His career, his later religious constancy and his tragic end have evoked general sympathy, but his conduct gave rise to grave suspicions, and the punishment inflicted upon him was not unwarranted; while the account of the severity of his imprisonment given by his anonymous and contemporary biographer should be compared with his own letters expressing gratitude for favours allowed.[2] There appears no foundation for the belief that he was poisoned, and according to Camden his death was caused by his religious austerities.[3] He was the author of a translation of *An Epistle of Jesus Christ to the Faithful Soule* by Johann Justus (1595, reprinted 1871) and of three MS. treatises *On the Excellence and Utility of Virtue*. Inscriptions carved by his hand are still to be seen in the Tower. He had two children, Elizabeth, who died young, and Thomas, who (restored in blood) succeeded him as 2nd earl of Arundel, and was created earl of Norfolk in 1644.

AUTHORITIES.—Article in the *Dict, of Nat. Biography* and authorities there collected; the contemporary *Lives of Philip Howard, Earl of Arundel and of Anne Dacre his Wife*, ed. by the duke of Norfolk (1857); M. Tierney, *History of Arundel* (1834), p. 357; C.H. Cooper, *Athenae Cantabrigenses* (1861), with bibliography, ii. 187 and 547; H. Howard, *Memoirs of the Howard Family* (1824).

THOMAS HOWARD, 2nd earl of Arundel, and earl of Surrey and of Norfolk (*c.* 1585-1646), son of Philip, 1st earl of Arundel and of Lady Anne Dacre, was born in 1585 or 1586 and educated at Westminster school and at Trinity College, Cambridge. Owing to the attainder of his father he was styled Lord Maltravers, but at the accession of James I. he was restored to his father's earldoms of Arundel and Surrey, and to the baronies of his grandfather, Thomas, 4th duke of Norfolk. He came to court, travelled subsequently abroad, acquiring a taste for art, and was created K. G. on his return in May 1611. In 1613 he escorted Elizabeth, the electress palatine, to Heidelberg, and again visited Italy. On Christmas day 1615 Arundel joined the Church of England, and took office, being appointed a privy councillor in 1616. He supported Raleigh's expedition in 1617, became a member of the New England Plantations Committee in 1620 and planned the colonization of Madagascar. He presided over the House of Lords Committee in April 1621 for investigating the charges against Bacon, whom he defended from degradation from the peerage, and at whose fall he was appointed a commissioner of the great seal. On the 16th of May he was sent to the Tower by the Lords on account of violent and insulting language used by him to Lord Spencer. He incurred Prince Charles's and Buckingham's anger by his opposition to the war with Spain in 1624, and by his share in the duke's impeachment, and on the occasion of his son's marriage to Lady Elizabeth Stewart without the king's approval he was imprisoned in the Tower by Charles I., shortly after his accession, but was released at the instance of the Lords in June 1626, being again confined to his house till March 1628, when he was once more liberated by the Lords. In the debates on the Petition of Right, while approving its essential demands, he supported the retention of some discretionary power by the king in committing to prison. The same year he was reconciled to the king and again made a privy councillor. On the 29th of August 1621 he had been appointed earl marshal, and in 1623 constable of England, in 1630 reviving

the earl marshal's court. In 1625 he was made lord-lieutenant of Sussex and in 1635 of Surrey. He was sent to the Hague in 1632 on a mission of condolence to the queen of Bohemia on her husband's death. In 1634 he was made chief justice in eyre of the forests north of the Trent; he accompanied Charles the same year to Scotland on the occasion of his coronation, and in 1636 undertook an unsuccessful mission to the emperor to procure the restitution of the Palatinate to the young elector. In 1638 he supported the king's exactions from the vintners, was entrusted with the charge of the Border forts, and, supporting alone amongst the peers the war against the Scots, was made general of the king's forces in the first Bishops' War, though according to Clarendon "he had nothing martial about him but his presence and looks." He was not employed in the second Bishops' War, but in August 1640 was nominated captain-general south of the Trent. In April he was appointed lord steward of the royal household, and in 1641 as lord high steward presided at the trial of Strafford. This closed his public career. He became again estranged from the court, and in 1641 he escorted home Marie de' Medici, remaining abroad, with the exception of a short visit to England in 1642, for the rest of his life, and taking up permanent residence at Padua. He contributed a sum of £34,000 to the king's cause, and suffered severe losses in the war. On the 6th of June 1644 he was created earl of Norfolk. He died at Padua, when on the point of returning home, on the 14th of September 1646, and was buried at Arundel.

Lord Arundel was a man of high character, an exemplary husband and parent, but reserved and unpopular, and Clarendon ridicules his family pride. His claim to fame rests upon his patronage of arts and learning and his magnificent collections. He employed Hollar, Oughtred, Francis Junius and Inigo Jones; included among his friends Sir Robert Cotton, Spelman, Camden, Selden and John Evelyn, and his portrait was painted by Rubens and Vandyck. He is called the "Father of vertu in England," and was admired by a contemporary as the person to whom "this angle of the world

oweth the first sight of Greek and Roman statues."[4] He was the first to form any considerable collection of art in Great Britain. His acquisitions, obtained while on his travels or through agents, and including inscribed marbles, statues, fragments, pictures, gems, coins, books and manuscripts, were deposited at Arundel House, and suffered considerable damage during the Civil War; and, owing to the carelessness and want of appreciation of his successors, nearly half of the marbles were destroyed. After his death the treasures were dispersed. The marbles and many of the statues were given by his grandson, Henry, 6th duke of Norfolk, to the university of Oxford in 1667, became known as the *Arundel* (or Oxford) *Marbles*, and included the famous *Parian Chronicle*, or *Marmor Chronicon*, a marble slab on which are recorded in Greek events in Grecian history from 1582 B.C. to 354 B.C., said to have been executed in the island of Paros about 263 B.C. Its narration of events differs in some respects from the most trustworthy historical accounts, but its genuineness, challenged by some writers, has been strongly supported by Porson and others, and is considered fairly established. Other statues were presented to the university by Henrietta Louisa, countess of Pomfret, in 1755. The cabinets and gems were removed by the wife of Henry, 7th duke of Norfolk, in 1685, and after her death found their way into the Marlborough collection. The pictures and drawings were sold in 1685 and 1691, and Lord Stafford's moiety of the collection in 1720. The coins and medals were, bought by Heneage Finch, 2nd earl of Winchelsea, and dispersed in 1696; the library, at the instance of John Evelyn, who feared its total loss, was given to the Royal Society, and a part, consisting of genealogical and heraldic collections, to the College of Heralds, the manuscript portion of the Royal Society's moiety being transferred to the British Museum in 1831 and forming the present Arundel Collection. The famous bust of Homer reached the British Museum after passing through various hands.

Lord Arundel married in 1606 Lady Alethea, daughter and heir of Gilbert Talbot, 7th earl of Shrewsbury, by whom, besides three sons who died young and one daughter, he had John, who predeceased him, Henry Frederick, who succeeded him as 3rd earl of Arundel and earl of Surrey and of Norfolk, and William, Viscount Stafford, executed in 1680. In 1849 the Arundel Society for promoting artistic knowledge was founded in his memory. Henry Frederick's grandson Thomas, by the reversal (1660) of the attainder of 1572, succeeded to the dukedom of Norfolk, in which the earldom has since then been merged.

AUTHORITIES.—See the article in the *Dict. of Nat. Biography*, and authorities there collected; D. Lloyd, *Mémoires* (1668), p. 284; Sir E. Walker, *Historical Discourses* (1705), p. 209 (MS. in Harleian, 6272 f. 152); M. Tierney, *History of Arundel* (1834), p. 414; Sir Thomas Roe's *Negotiations* (1740: letters relating to his collections), 334, 444, 495; W. Crowne, *A True Relation of all the Remarkable Places ... in the Travels of ... Thomas, Earl of Arundell: A.D. 1636* (1637); *Die englische Mission des Grafen v. Arundel in Nurnberg (archivalische Zeitschrift*: neue Folge, Bd. xi., 1904); H. Howard, *Memorials of the Howard Family* (1834), p. 31; H.K.S. Causton, *The Howard Papers* (1862); *Preface to Catalogue of Arundel MSS.*, Brit. Museum (1840), &c. For publications relating to the Parian Chronicle see *Marmora Arundelliana*, publ. J. Selden (1628); Prideaux's *Marmora Oxoniensia* (1676); Maittaire's variorum edition (1732); Chandler's *Marmora Oxoniensia* (1763 and 1791), G. Roberts; J. Robertson, *The Parian Chronicle* (1788); J. Hewlett, *A Vindication* (1789); R. Porson, "The Parian Chronicle," in *Tracts*, ed. by T. Kidd (1815); *Chronicon Parium*, ed. by C.F.C. Wagner (1832-1833); C. Müller's *Fragmenta Historicorum Graecorum* (1841), i. 533; F. Jacoby, *Das Marmor Parium* (1904).

1 *i.e.* in the Howard line.

2 See *Cal. of St. Pap. Dom. 1581-1590*. 611; and *Hist. MSS. Comm. Marq. of Salisbury's MSS.* iii. 253, 414.

3 Camden's *Elizabeth* in *Hist. of England* (1706), 587.

4 Peacham in *Compleat Gentleman* (1634), p. 107, and *Secret Hist. of James I.* (1811), i. 199.

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