

For purposes of comparison, the editor has given an engraving of an enamelled bronze cup, of similar shape and method of manufacture, which was found at Harwood, in Northumberland, and is now in the British museum. He also describes a facsimile cast of a beautiful vessel, known as the 'Bartlow vase,' the original of which was nearly ruined in a fire which took place in the mansion of Lord Maynard, by whom it was discovered in 1832, during excavations made in a series of remarkable flat-topped tumuli situated at Bartlow, in Essex. A plate showing it in all its pristine beauty may be found in *Archaeologia*, vol. 26, pl. 35. It is now in the British museum, where can also be seen a similar vase, discovered at Ambleteuse, near Boulogne. Still another of the same character, found in the western part of France, is preserved at Angoulême. Finally in the *Mémoires de la société des antiquaires du nord*, n.s., 1868, there is represented an exceedingly beautiful specimen of an enamelled bronze cup of the same pattern, discovered in 1867 in a peat-moss at Maltboeck, in the southern part of the peninsula of Jutland, in Denmark.

Beside these vases, enamelled fibulae and horse-trappings have frequently been found in ancient graves, especially in England. Professor Boyd Dawkins, in his Cave-hunting, also gives a plate representing several brooches of this kind, which were discovered during the explorations of the Victoria cave, in Settle, Yorkshire. This was so named on account of its discovery upon the coronation day of Queen Victoria, in 1839; and it is especially interesting as having been a place of refuge of the miserable British fugitives who fled before the sword of the 'conquering England.'

The art of enamelling was known to the ancient Egyptians, the Etruscans, and the Greeks; but the last had ceased to make use of it at least two hundred years B.C. By the Romans it was never practised at all; and it is not alluded to by Pliny in his encyclopedic

'Natural history.' The only reference to it to be found in any ancient author occurs in the *Imagines* of Philostratus the elder (lib. i., im. 27). In a description of a picture of a boar-hunt, after enumerating the different colors of the horses ridden by the youthful huntsmen, and saying that the bits were of silver and the housings enriched with gold and various colors, he adds, "They say that the barbarians, who dwell near the ocean, pour these colors upon heated brass, and that they adhere, and become like stone, and preserve the designs made by them." Now, Philostratus was a Greek rhetorician, called from Athens, in the beginning of the third century, to the court of Julia Domna, wife of the emperor Septimius Severus. As this emperor passed considerable time in Britain, where he built, or at any rate repaired, the wall that goes by his name, and died at York, it is by no means improbable that Philostratus gained his knowledge of the processes of enamelling from accounts brought to the court from that region. To the English antiquaries it seems to be established, by the number and the beauty of such objects that have been discovered in their own country, that this was the principal seat of its manufacture; and Mr. John R. Green does not hesitate to call the 'party-colored enamel the peculiar workmanship of Celtic Britain.' But from the fact that the late Abbé Cochet has found precisely similar enamelled objects in his explorations of ancient cemeteries in Normandy, and from the discovery of cups of the same kind upon the soil of France, the antiquaries of that nation maintain that their own countrymen were 'the barbarians that dwelt near the ocean.' *Non nostrum tantas componere lites*; but certainly objects of this character ought never to be styled 'Roman.'

We wish that we had more space at our disposal to direct attention to the many other beautiful objects of antiquity to be found in this fine collection. HENRY W. HAYNES.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Linear differential equations.—M. G. Floquet, in a paper entitled "*Sur les équations différentielles linéaires à coefficients périodique*," has made an interesting and seemingly important addition to the literature of periodic functions. He considers a homogeneous linear differential equation of the form

$$P(y) = \frac{d^m y}{dx^m} + p_1 \frac{d^{m-1} y}{dx^{m-1}} + p_2 \frac{d^{m-2} y}{dx^{m-2}} + \dots + p_m y = 0,$$

the coefficients being uniform functions having all the same period, ω , and the general integral being supposed uniform. If the variable be changed by the substitution

$$\frac{2\pi i x}{\omega} = \xi,$$

the result is a linear transformation of P , in which the coefficients are uniform functions of ξ . From the known expression for its integrals in the region of a

singular point, we may, by giving ξ the above value, vary the form of the solutions of $P(y) = 0$. The author prefers, however, to treat the question directly, inasmuch as he is thus enabled to employ many of the results arrived at by M. Fuchs, and as he can use processes identical with those employed by Fuchs in his study of the integrals around a singular point. M. Floquet obtains thus a fundamental system, S , of solutions connected with a certain algebraic equation, $\Delta = 0$, which he calls the *fundamental equation relative to the period* ω ; the first member of $\Delta = 0$ is a determinant of degree m with respect to the unknown ϵ . The elements of the system S constitute as many *groups* as the equation $\Delta = 0$ has distinct roots; and, by applying a process due to M. Hamburger, these groups are divided into *sub-groups* which are mutually independent. The particular conclusions arrived at are as follows. I. Let $\epsilon_1, \epsilon_2 \dots \epsilon_n$ denote the distinct roots of $\Delta = 0$; let λ_i denote the order parting from which the minors of Δ cease being all zero for $\epsilon = \epsilon_i$. 1°. $P = 0$ admits as distinct integrals $\lambda_1 + \lambda_2 + \dots + \lambda_n$ periodic functions of the second kind, and no more. 2°. There exists a fundamental system of solutions, including, first, $\lambda_1 + \lambda_2 + \dots + \lambda_n$ periodic functions of the second kind; second, $m - (\lambda_1 + \lambda_2 \dots + \lambda_n)$ expressions, each having the form of an integral polynomial in x , and having for coefficients periodic functions of the second kind possessing the same multiplier. 3°. The multipliers of the periodic functions which appear in the fundamental system, either as elements or as coefficients in the elements, are equal to the different roots $\epsilon_1, \epsilon_2 \dots \epsilon_n$ of the fundamental equation. II. In order that $P = 0$ may have m periodic functions of the second kind as distinct integrals, it is necessary and sufficient that each of the roots of $\Delta = 0$ shall annul all the minors of Δ up to those of an order equal to the degree of the multiplicity of each root. In the above, a periodic function of the second kind, with a period ω , means a function defined by relation $F(x + \omega) = \epsilon F(x)$; ϵ is the multiplier; and, if $\epsilon = 1$, the function is said to be periodic of the first kind. — (*Ann. l'école norm. sup.*, Feb.) T. C. [134]

PHYSICS.

(Photography.)

The effect of pressure on the gelatine film. — Capt. Abney has shown, that, if pressure is applied to the sensitive surface of the gelatine plates, the same result is obtained as if the plate had been exposed to the light. The editor of the *British journal of photography*, experimenting further, finds that abrasion, such as may be produced by the motion of a glass rod drawn out to a fine rounded point, is necessary to the action, and that mere pressure, such as would be obtained by a carpenter's vise, produces no effect whatever. A stripped film was next placed upon the other one, and the markings made with the rod upon it, with very heavy pressure. On development with pyro, no effect was at first produced; but, by prolonged action, a green fog was created in the adjacent regions of the film, leaving the figures clear on a dark ground. — (*Brit. journ. phot.*, June 15.) W. H. P. [135]

Electricity.

Unipolar conductivity. — Hugo Meyer confirms the result previously obtained by him, that the mineral psilomelan possesses the curious property of unipolar conductivity for electricity. He finds, also, that the resistance to a constant current is independent of the duration of the current, and that different specimens of the mineral are radically different in electrical properties: hence the inconsistent results of different observers are admissible. — (*Ann. phys. chem.*, xix. 70.) J. T. [136]

A cheap bolometer. — C. Baur describes a thermoscope which consists of thin gold leaves blackened with platinum chloride, and cut so as to combine large surface with low resistance. These are attached to opposite ends of a cylinder which is hollow and open at the ends, and solid in the middle. These leaves are made the arms of a Wheatstone bridge, and prove to be a much more delicate test for radiant heat than the thermopile. The author terms the instrument a radiometer. — (*Ann. phys. chem.*, xix. 12.) J. T. [137]

Measurement of the ohm. — J. Fröhlich describes a 'dynamometric' method of measuring the ohm: the secondary coil is balanced on a rigid horizontal arm, suspended bifilarly so that the plane of winding is perpendicular to the meridian; opposite is placed the inducing coil, in which, by an ingenious arrangement of keys, the current is made, shunted, and broken without a spark. The consequent attractions and repulsions are measured by the swinging of the suspended apparatus. From a preliminary experiment, the author is encouraged to consider the method a practical one. — (*Ann. phys. chem.*, xix. 106.) [138]

ENGINEERING.

Engines of lake steamers. — One of the steamers of the Western transportation line has engines of the 'compound' type, two low and two high pressure cylinders, of 20 and of 40 inches diameter and of 40 inches stroke. The steam is cut off at 8 inches in the high-pressure cylinder, and the consumption of steam amounts to but 19 pounds per hour and per horse-power. The boat is 256 feet long, 38 feet beam, and 16 feet draught. The engines and boilers weigh about 100 tons. The latter have 100 square feet of grate-surface, and 3,366 square feet of heating-surface. Another vessel, the E. B. Hale, has simple engines, carries 1,600 tons of freight at 14 feet draught, makes about 10 knots an hour on 1,400 pounds of coal. The engines are 36 by 36, and are supplied with steam by one boiler 12 feet in diameter by 18 feet long. — (*Mechanics*, June 23.) R. H. T. [139]

Heating by superheated exhaust-steam. — Mr. Levi Hussey has devised a method of heating buildings in winter by the exhaust-steam from engines by first passing it through a superheater in the flue, and there taking up heat which would otherwise be sent up the chimney and wasted. The steam is thus deprived of all moisture, and then heated to so high a temperature that it will heat more thoroughly, and with less obstruction by back-press-

ure, than saturated and wet steam. Heat is thus obtained without cost, and rendered effective for useful application to a greater extent than has hitherto been possible. — (*Amer. mach.*, July 7.) R. H. T. [140]

CHEMISTRY.

(Analytical.)

Electrolysis of bismuth solutions. — Messrs. N. W. Thomas and E. F. Smith find that bismuth may be accurately determined in solution either as sulphate or as citrate by electrolysis. By three bichromate cells all the bismuth was deposited in a compact form in three hours. It was washed, first with water, then with alcohol, dried, and weighed. The reduction goes on equally well in a solution containing an excess of citric acid. — (*Amer. chem. journ.*, v. 114.) C. F. M. [141]

Estimation of hardness in water without soap solution. — Instead of the usual method for estimating the hardness of water, O. Hehner prefers titration with standard sulphuric acid and sodic carbonate solutions. He claims that the results obtained with the soap solution are very variable and wholly unreliable. — (*Analyst*, May, 1883.) C. F. M. [142]

The presence of copper in cereals. — In an article on this subject, Mr. E. F. Willoughby reviews the instances in which copper has been found in cereals, and he quotes the following results obtained by Dr. V. Galippe:—

	Copper in a kilogram.
Wheat from Central France	0. 0100 grm.
“ “ La Châtre (Indre)	0. 0080 “
“ “ Grand Villiers (Oise)	0. 0052 “
“ “ Michigan	0. 0070 “
“ “ America (Redwinter)	0. 0085 “
“ “ California	0. 0050 “
“ “ Native Bric	0. 0054 “
“ “ America, soft	0. 0108 “
“ “ Russia, hard (Taganrog)	0. 0088 “
“ “ Algiers, hard	0. 0062 “
Rye	0. 0050 “
Oats	0. 0084 “
Barley	0. 0108 “
Rice	0. 0016 “

— (*Analyst*, May, 1883.) C. F. M. [143]

AGRICULTURE.

Preserved milk. — Loew found that a sample of milk which had been sealed up and heated to 101°, and then preserved for eight years, had undergone decided change. The color was brownish, and the taste intensely bitter. The milk-sugar was changed into dextrose and levulose; the caseine and albumen, into peptone. A sediment yielded crystals of tyrosin after boiling with potash. Milk preserved for a year by Scherff's process was found by Vieth considerably altered in taste, but samples kept in a cool cellar for several months appeared unaltered. — (*Bied. centr.-blatt.*, xii. 57.) H. P. A. [144]

Calculation of feeding-rations. — In two feeding-experiments with steers, Caldwell and Roberts found that a ration calculated to correspond to that

recommended by Wolff for maintenance caused a very decided and steady gain in weight, while a richer ration gave much greater gains than have been obtained by other experimenters from rations calculated to furnish the same amounts of digestible matters. They conclude that “We have not yet sufficient data, from actual feeding-experiments, upon which to base a reliable calculation of the maintenance-ration, or of a ration for the production of a certain effect.” — (*Rep. Cornell univ. exp. stat.*, 1882-83, 18.) H. P. A. [145]

Determination of proteine. — Trials of Stutzer's method of separating true protein from other nitrogenous matters failed to give Newbury concordant results in the case of several concentrated fodders, and numerous difficulties in manipulation were experienced. With coarse fodders the results were concordant. — (*Rep. Cornell univ. exp. stat.*, 1882-83, 34.) H. P. A. [146]

Determination of phosphoric acid. — Pemberton's method for the volumetric determination of phosphoric acid in fertilizers by titration with a standard solution of ammonium molybdate gave results closely agreeing with gravimetric determinations. Two improvements in the process are described. — (*Rep. Cornell univ. exp. stat.*, 1882-83, 29) H. P. A. [147]

MINERALOGY.

Peculiar crystals of fluorite. — On a hand specimen of fluorite, probably from Zinnwald, Bohemia, F. J. P. Van Calker noticed that there were on all of the small crystals, which were combinations of cube, hexoctahedron, and octahedron, well-defined markings on each cubic face, making a perfect rectangle whose sides were parallel to the intersection of the cube and octahedron. To account for these peculiar markings, which were present on all of the crystals, the author suggested that each crystal might originally have been of a simpler form, around which a subsequent shell of fluorite had been deposited; and a section from a single crystal, cut near and parallel to a cubic face, showed, when examined by transmitted light, a colorless centre, with the rectangular marking appearing as a dotted line, and outside of this another colorless portion completing the crystal. This fully confirmed the author's suggestion of an enclosure of fluorite in fluorite, showing that the crystals were originally of simple form, combinations of cube and octahedron, which had become coated with some pigment, and subsequently another deposit of fluorite had taken place, building up the hexoctahedron planes on all of the solid angles. — (*Zeitschr. kryst.*, vii. 447.) S. L. P. [148]

GEOLOGY.

Lithology.

The eruptive rocks of Tryberg, Schwarzwald. — George H. Williams has published for the doctorate degree a valuable petrographical paper on the Tryberg region, the country rocks of which are gneiss, granite, and granite, cut by dikes of granite, quartz-porphry, mica-syenite-porphry, mica-dio-

rite and nepheline-basalt, while porphyrytuff occupies a portion of the Kesselberg area. The granitite is a crystalline granular mixture of felspar, quartz, and biotite, and is regarded as a typical rock of its kind. The quartz-porphry has a compact, red groundmass porphyritically enclosing quartz and felspar, also biotite, apatite, and magnetite. The mica-syenite-porphry has a compact, deep reddish-brown groundmass, holding biotite and felspar, as well as some quartz, apatite, and zircon.

The nepheline-basalt shows a compact, greenish-black groundmass, holding crystals and grains of a fresh, nearly colorless olivine. The groundmass is composed of a mixture of augite, little olivine crystals, and magnetite grains cemented by a colorless mass of nephelite and glass. Some reddish-brown biotite was observed, while apatite in little needles occurs abundantly. The paper is accompanied by a plate and map, while the classification followed is that of Prof. Rosenbusch of Heidelberg, with whom Dr. Williams studied. This classification of eruptive rocks is now the prevailing one in Germany, and, on account of the number of Rosenbusch's students connected with the U.S. geological survey and with other institutions, will be soon generally used in America. — (*Neues jahrb. min., beil.*, 1883, ii.) M. E. W.

GEOGRAPHY.

(*Arctic.*)

Danish expeditions in Greenland in 1883. — Dr. Rink, who is now resident in Kristiania, gives some details as to the proposed work for this season. Lieut. G. Holm, assisted by Lieut. Garde, geologist Knutsen, botanist Eberlin (who also acts as surgeon), and a number of Greenlanders, will undertake the exploration of the eastern coast of Greenland in umiaks, in the narrow strip of water between the great stream of drift-ice and the shore, where these boats may be able to accomplish much not practicable for a vessel. They will endeavor to pass the northern extreme reached by Graah, 1828-30, and to penetrate to the interior by some of the deep fiords, thus obtaining some idea of the region between them and the western coast. The other expedition will endeavor to map the unexplored portion of the western coast between 67° and 70° N. lat., and will be commanded by Lieut. Hammer, assisted by Sylow as geologist, and naval Lieut. Larsen. Notice has already been taken of the arrival of these parties in Greenland. — (*Naturen*, Mai, 1883.) W. H. D. [149]

(*South America.*)

The death of Crevaux. — The details of the destruction of this gallant explorer and his party have been obtained from a native interpreter, who was made captive at the time, but finally escaped across the desert to Ankaroinga. The party had arrived at a spot on the right bank of the Pilcomayo, five leagues above the Rio Tigre, where there is a village of Toba Indians called Cuvarocal. After having been assured of a peaceful welcome, the doctor began to distribute presents to the natives, who, at the advice of their chief, rendered covetous by the sight of the valuables in the hands of the party, fell suddenly upon the ex-

plorers, and killed those on the shore. Those still in the boats attempted to escape by swimming, and were pursued, and several of them killed in the water. Only two, Haurat and Blanco, being good swimmers, succeeded in reaching the opposite shore, and hiding themselves in the forest. Nothing has been heard of them since. The interpreter was carried off as a prisoner. The bodies were thrown into the water or left where they fell, except that of Dr. Crevaux, which was carried to a neighboring village, where for thirty-six hours the Tobas sang and performed incantations around it, after which it was conveyed to a spot near to and visible from the huts. The Argentine government has sent Col. Sol with two hundred men up the Pilcomayo to punish the assassins, while the geographical society of Buenos Ayres has sent one of its number to search for the two survivors, and report on the whole subject. — W. H. D.

[151]

Crevaux's voyages in Guiana. — Henri Froidevaux summarizes previous investigations of the rivers of Guiana, and narrates the advances due to Crevaux. He notes that the indigenous population of Guiana is visibly decreasing, and states that Crevaux believed, that, judging by the abundance of village sites and relics on the river-banks now absolutely depopulated, there was formerly an abundant population. — (*Rev. géogr.*, May, 1883.) W. H. D.

[152]

Notes. — Dr. Güssfeldt has made interesting trigonometrical surveys in the Cordillera, together with observations on glaciers. He will soon take up the region about Aconcagua. — The English brothers Haspold, with the warmest approbation of the government of the republic, have undertaken a very exact geological, mineralogical, and natural history survey of the different Argentine states. — (*Mitt. geogr. ges. Wien*, xxvi. no. v.) W. H. D.

[153]

(*Africa.*)

Number of Jews in Africa. — According to the estimate of Brunialti, the Jews in Africa number 450,000. Gerhard Rohlfs criticises this as much too high, and, by reviewing the estimates of population in all parts of the continent, concludes that 220,000 is much nearer the truth. — (*Peterm. geogr. mitth.*, 1883, 211.) W. M. D.

[154]

The coast-line of Tunis. — In his description of the Mediterranean lands, Th. Fischer has included Tunis in the area of rising coasts about Sicily, Sardinia, and south-eastern France. The correctness of this is questioned by Dr. J. Partsch of Breslau, who presents a considerable mass of evidence to show that the Tunisian shores have not changed their altitude in the historic period, although their outline has varied distinctly at certain points by delta growth. The river Medjerda (the ancient Bagradas) has shifted its mouth several miles to the north, and built out its delta into the Gulf of Tunis; and this in combination with the wind-action, by which sand has been blown inland from the shore, has added nearly one hundred square miles of lowland outside of the coast-line of the third century before Christ. Former lines of river-flow are distinctly visible at

several points. But all this, and other facts of a similar nature, must not be explained by an elevation of the land; for the ruins of Carthage, on a promontory a few miles to the south, are still close to the sea, and the remains of some of its harbor-works are yet at the water's edge. A variety of ancient and modern descriptions of this region are referred to. — (*Peterm. geogr. mitth.*, 1883, 201, map.) W. M. D. [155]

ZOOLOGY.

Protozoa.

New sporozoon. — A. Schneider has discovered in the Malpighian vessels of *Blaps* an amoeboid parasite. Multiplication takes place principally by means of cysts. Encystment occurs only between individuals with a single nucleus and of spherical form. The two conjugated organisms secrete around themselves several envelopes, each marked with an equatorial line of dehiscence. Each of the two nuclei divide into three. Of the six nuclei thus formed, four, together with a part of the granular mass, remain unused, while the other two become the spores. The species is named *Ophryocystis Bütschlii*. — (*Comptes rendus*, 1883, 1378; *Ann. mag. nat. hist.*, xi. 459.) C. S. M. [156]

Insects.

Observations on Hymenoptera. — In part x. of his *Observations*, Lubbock answers some of Dr. Müller's objections to his methods in studying the color-preferences of the hive-bee, believing that his conclusions are not invalidated by them. To test the sense of hearing in bees, telephonic communication was established between two sets of bees, one of which was then excited, but with no effect on the other. Others were accustomed to visit honey placed near a music-box, the position of which was several times changed. The bees did not, however, appear to hear the music, though they seem to have connected the presence of the instrument with that of the honey, and were guided by it, even if it were not playing, so long as they could see it; but if they could not see it, even if it were playing, it did not assist them. It is, however, uncertain but that high over-tones, beyond our range of hearing, may be audible to bees.

Further experiments seem to show that the industry of wasps has been underrated. One individual visited some honey no less than a hundred and sixteen times in a day, loading herself each time, and carrying away more than sixty-four grains of honey. Her working-hours extended from 4.13 A.M. to 7.47 P.M., while a bee, working on honey the same day, made but twenty-nine visits, between 5.45 A.M. and 7.15 P.M.

A curious demonstration of the recognition of the queen by worker-ants was made in the following way: "I was starting a new nest of *Lasius flavus* in which were two queens. We allowed the ants to take one of them into their new glass house; the other we kept with a small retinue in a separate bottle. If this bottle is placed near the nest, some of the retinue leave it, go into the nest, and soon the

ants come out in large numbers to see, I had almost said to pay their respects to, their queen."

The dislike of ants for the ultra-violet rays of the spectrum, indicated by earlier experiments, was further shown by the use of two screens, — one consisting of a solution of iodine in carbon bisulphide; the other of indigo, carmine, and roseine, mixed so as to produce the same tint, but not, like the bisulphide solution, intercepting the ultra-violet rays. The ants collected, in most instances, under the iodine screen.

The record of the occurrence of *Ponera contracta* in England, and the description of a new Australian honey-ant, *Melophorus Bagoti*, are of interest to the systematist. — (*Journ. Linn. soc.*, zool., xvii.) W. T. [157]

(Economic entomology.)

Insects affecting the strawberry. — Professor S. A. Forbes summarizes what has been published respecting the insects that infest the strawberry in the United States, and adds original observations respecting several of them. These observations refer chiefly to the crown-borer, the root-worm, and the crown-miner. A very useful calendar is given, indicating in a concise form the periods of each of the species discussed and the particular place in which each insect occurs in each of its stages. — (*Trans. Miss. Valley hort. soc.*, 1883.) J. H. C. [158]

The hop-vine borer. — Although this pest has been very destructive for many years, the life-history of the species has not been known till now. Prof. Comstock gives an account, with figures, of the insect in each of its stages. — (*Amer. agric.*, June, 1883.) [159]

VERTEBRATES.

Are the lungs air-tight? — That the lungs are normally air-tight under the ordinary condition of life has been accepted in physiology as an almost necessary consequence of the function which they perform. Ewald and Kobert have lately reported some experiments which appear to show that this belief is not strictly correct. If the intra-pulmonic pressure is raised above a certain limit, not higher than may occur normally during life, there is an escape of air from the lungs into the pleural cavity or into the blood-vessels of the pulmonary circulation. When a curarized dog was exposed to artificial respiration at a proportionally high pressure for about an hour, the dog killed, and the chest opened under water, both the pleural cavity and the heart were found to contain air. Experiments made upon excised lungs, expanded under water by positive pressure, showed, that, at a certain pressure, air escaped, while, if the pressure was again lowered, the lungs again became air-tight. The authors satisfied themselves in all cases that there was no actual gross rupture of the lung-tissue or blood-vessels. The maximal expiratory pressure which a dog can produce was found to vary between 50 mms. and 90 mms. of mercury; while, to get an escape of air into the pleural cavity or heart, it was only necessary to keep the intra-pulmonic pressure at about 35 mms. of mercury. A similar result was obtained with rabbits. The escape of air

may take place not only through the walls of the alveoli, but also through the trachea, with the production of emphysema of the subcutaneous cellular tissue of the neck, which in time may spread as far as the extremities of the body. The peculiar pains in the chest which sometimes follow upon violent expiratory efforts may be owing, they think, to a small escape of air into the pleural cavity. So many hitherto inexplicable cases in which, after sudden death, air has been found in the heart or pleural cavity, although there was no evidence of any rupture, may be explained in this way by the escape of air through the lung-tissue. — (*Pflüger's archiv*, xxxi. 160.) W. H. H. [160]

Structureless basal substance. — The structureless substance which forms the basis of the 'jelly' in medusae, Emery thinks, is still represented in the higher animals, preceding in certain places the true connective tissue. Emery employs the name given by Hensen, 'tissue of secretion,' it being supposed to be secreted by the surrounding epithelia. In vertebrates an anhistie layer in the cornea precedes the true connective tissue (Kessler, Emery). In the embryos of teleosts, particularly those that leave the egg early, the ectoderm is separated by a thick layer of homogeneous, unorganized matter from the inner tissues. This hyaline mass also fills out the embryonic median fins. It is probably changed later into connective tissue by the immigration of cells. The clear membranes separating two adjacent epithelia, or an epithelium from connective tissue, the vitreous humor, and the substance filling the segmentation cavity of the ovum, are also, perhaps, to be enumerated here as preservations of a very ancient primitive formation, — the tissue of secretion of the most distant ancestors of vertebrates. Its excessive development in teleost larvae is probably an acquired embryonic characteristic. This interesting little paper especially deserves attention from those studying the embryology of fishes. — (*Arch. ital. biol.*, iii. 37.) C. S. M. [161]

Fish.

Motor-nerve endings. — Ciaccio has investigated the motor-nerve plates in the depressor muscle of the jaw of *Torpedo marmorata* by treatment with double chloride of gold and cadmium. From the anterior third of the muscles, strips one millimetre thick were cut with scissors; the strips were then left for five minutes in fresh filtered lemon-juice, washed in distilled water, and placed for half an hour in a one-per-cent solution of gold and cadmium, being kept dark; washed again in one-per-cent aqueous solution of formic acid, in which they were left twelve hours in the dark, then twelve in the light; finally, kept in the dark in stronger formic acid for one day, and preserved in glycerine. Such strips may be easily dissociated into fibres.

Two forms of nerve-endings are observed. One, the rarer, represents probably the initial form: it consists of bunches of grains, suspended by peduncles arising by repeated division of the pale fibres towards their termination. The second form has been previously described (*Mem. accad. sc. istit. Bologna*,

1877), but the following new points deserve mention: the end-plate appears to be more closely united to the sarcolemma than to the muscular substance; between the ramifications of the fibres appear certain corpuscles, probably connective tissue, but whether they lie within or without the sarcolemma was not determined; a secondary sheath extends over the primary and secondary, but stops at the tertiary branches; the ultimate terminations are bunches of pedunculated grains, the grains being colored dark, their stalks light; finally, the presence of a granular embedding substance around the nervous branches. — (*Arch. ital. biol.*, iii. 75.) C. S. M. [162]

Fishes of the Batstoe River, New Jersey. — Professor E. D. Cope stated that eleven species collected in the confined waters of a broken dam on the Batstoe River, New Jersey, represented the fish fauna of the Carolinian district of the nearctic realm, only three extending into the Alleghanian district. A species of *Amiurus* new to science was at first supposed to be an unusually dark-colored example of the common *Amiurus nebulosus*. A critical examination soon showed that it differs in the important characters of the considerably more anterior position of the dorsal fin, four to seven more anal radii, and more rounded outline of the caudal fin. Its characters ally it to the western *A. natalis*, from which it differs by its more slender form and more rounded caudal fin. The name *A. prosthistius* was proposed for it. — (*Acad. nat. sc. Philad.*; meeting June 26.) [163]

Mammals.

Color-markings of mammals. — Professor Eimer has continued his studies in regard to the color-markings of vertebrates.

As the result of his observations, he has drawn out certain general principles, which he applies to the different groups, notably to the mammals.

The following general statements are elaborated:

1. That the color-markings of mammals may be reduced to longitudinal stripes, spots, and transverse stripes; 2. That the longitudinal stripes are the oldest form, and that the other two follow in course; 3. That the primitive mammalian fauna was a longitudinally striped one; 4. That the males have been first to take on the new forms of markings, while the females hold longer to the older form; 5. That the effects of the law by which the development of the markings takes place from the posterior part of the body toward the anterior part are not so easily traced in mammals as in the case of other groups, such as the saurians; 6. That in mammals the development of markings follows a regular course, that is, the longitudinal markings are followed by spots, which, in turn, run together, and finally form the transverse or tiger stripes; 7. That the position of the smallest spot on a mammal is not accidental, but due to the action of genetic and philogenetic laws, from which it follows that markings are an available means for the determination of species; 8. That the regularity of the development of markings shows that they arise from constitutional causes.

The author takes the Viverridae as the original

types of the carnivores, and believes that in the hyena, cats, dogs, bears, and weasels, he can trace the form and position of markings possessed by the former. He acknowledges several difficulties, however, in the case of the leopard, jaguar, and other peculiarly spotted cats. He believes that the ungulates follow the same law in regard to markings as the carnivores. — (*Jahresh. verein vaterl. naturk. Württ.*, xxxix. 1883. 56.) F. W. T. [164]

(Man.)

Function of the crico-thyroid muscle.—Martel brings forward some experiments to show that the crico-thyroid, and not the thyro-arytenoid muscle is par excellence the muscle used in the production of different tones in singing and speaking. The most interesting point of the paper, perhaps, is, that he shows, by registering with simple levers the movements of the thyroid and cricoid cartilages respectively, that, when the different chest-notes (from do^2 to do^4) are sounded, the thyroid cartilage remains immovable, while the cricoid is brought closer and closer to it as the pitch of the note is raised. In the contraction of the crico-thyroid muscle, or, as he prefers to call it, the thyro-cricoid muscle, the thyroid cartilage is therefore to be considered as the fixed point. The action of the thyro-arytenoid muscle, according to him, is preparatory to that of the crico-thyroid, in that it gives the vocal cords their proper position, and acts as an antagonist to the latter muscle. The length and tension of the vocal cords, however, are governed by the crico-thyroid. This view of the function of the crico-thyroid is supported by the results obtained when the muscle, or the nerve going to it, is divided in the dog, and, among men, by the pathological cases in which there is paralysis of this muscle. The general result in such cases is a pronounced hoarseness, and an inability to sound any but the lowest tones. — (*Arch. de physiol.*, 1883, 582.) W. H. H. [165]

Summation of stimuli in the sensory nerves of man.—From numerous experiments made upon himself with electrical stimuli, de Watteville comes to the conclusion that the action of stimuli applied to a sensory nerve increases, within certain limits, with their frequency. Stimuli which are subminimal, as long as they follow at slow intervals, will call forth a sensation when made to follow each other with greater rapidity. This summation takes place more readily when the stimulated nerve is exposed to the action of the kathode; and the author is of the opinion that it is local, as in motor nerves, and not central. The summation may be explained as the after action of electrical stimulation; the induction shocks following with such rapidity that the excitation in each case falls within the period of heightened irritability. — (*Neurol. centralbl.*, no. 7, 1883.) W. H. H. [166]

ANTHROPOLOGY.

Tribute to American scholarship.—An interesting tribute to American scholarship is paid in the fact that M. Barbier, on the authority of Mr. Stephens and later writers, was setting up Del Rio's 'images of men in bas-relief' in front of the model of the

Temple of the Sun, as he had done in the Trocadero. Dr. Rau of the Smithsonian institution drew his attention to Del Rio's description of the Temple of the Cross, as well as to the statements of Dupaix and Galindo; and the bas-reliefs at Washington will stand in their proper place in front of the shrine containing the group of the Cross. Again, Prof. Cyrus Thomas has discovered that the cast on the left slab of the Tablet of the Cross proves conclusively the correctness of the statement previously made in SCIENCE, that Waldeck's figure of this slab, as published by the French scientific commission, 1860-66, was copied from Catherwood's drawing. This is proved by the fact that Catherwood's errors, of which M. Charnay's cast brings to view quite a number, are all faithfully reproduced in Waldeck. — O. T. M. [167]

Prehistoric trepanning.—The object of recalling attention to this much described subject is to speak of the novel experiments of L. Capitan. Many years ago Dr. Charles Rau, wishing to know how long it would take a savage to bore a hole through a hard rock with a wooden spindle, using sand and water, actually made the experiment, and has put on record his experience. M. Capitan has proceeded in the same way respecting prehistoric trephining, testing the various methods of boring and of removing a rondelle or fragment of bone. The experiments on the skulls of the dead were to study the methods, the difficulties in the way of the operation, and the time required. It is the trephining of the living among savages, and the fatality of the result, that most interest the student: therefore M. Capitan continued his researches upon living canine subjects. The first experiment was upon a small spaniel. The skin of the head and temporal muscle were removed, and the trephining was practised upon the antero-superior portion of the right parietal. The operation was not very painful, and in twenty minutes a rondelle of bone was removed. There was little hemorrhage and the meninges were not wounded. After a few days the spaniel was as lively as ever. Two other dogs were subsequently treated, with like success. Just what the method and amount of cicatrization might be, after such primitive operations, will be known when the autopsy of the subjects takes place in the future. — (*Bull. soc. anthrop. Paris*, v. 535.) J. W. P. [168]

Catlinite.—The beautiful red stone pipes in collections of Indian culture-objects are made of a stone called catlinite. Mr. E. A. Barber tells us that for many generations the aborigines have procured this material from the Great red pipestone quarry, situated on the dividing-ridge between the Minnesota and Missouri rivers, at a place called by the French *Couteau des prairies*. Catlin, the celebrated traveler, was the first white man permitted by the Indians to visit the place; and therefore Dr. C. T. Jackson, to whom specimens were sent, named the mineral catlinite. The myths relating to the quarry, as well as surface indications, show that the place has been worked for a very long time. In 1673 Marquette smoked in peace a catlinite pipe with the Indians of the upper Mississippi. Father Hennepin applies the term 'calumet' to these ceremonial pipes. There is no

doubt that an extensive traffic was carried on in this material for a considerable length of time by the aboriginal tribes, extending from the Atlantic coast to the Rocky Mountain system and from New York and Minnesota on the north to the Gulf of Mexico. The fact that objects of catlinite have been taken from Indian graves in the state of New York, and that others were found on the ancient site of an abandoned village in Georgia, at opposite points twelve hundred miles distant from the pipestone quarry of Minnesota, reveals the great extent of intercommunication which formerly existed among the North American peoples. When we consider that many pipes of catlinite have been taken from the bottom of mounds from four to seven feet deep, where they were found in connection with cloth-wrapped copper axes and many other objects of high antiquity, and that some of them are of the typical form of the oldest mound-pipes, we are forced to ascribe to some of them a high antiquity. — (*Amer. nat.*, July.) J. W. P. [169]

The Charnay collection.—Visitors to the National museum at Washington are surprised to find the great hall adjoining the last doorway on the south side shut off by screens. Looking behind this barricade, the visitor may imagine himself transported to Central America, and in the presence of some of her grandest aboriginal remains. Here M. Barbier, from the Trocadero museum at Paris, is setting up casts of the most celebrated relics of Mexican and Central American ruins secured by M. Charnay. The readers of SCIENCE will recall that Mr. Pierre Lorillard of New York, conjointly with the French government, equipped an expedition in 1880, and maintained it for two years, for a systematic investigation of the so-called 'ruined cities' and other remains of ancient civilization in Central America and Mexico. The expedition was placed under the charge of M. Désiré Charnay, and thoroughly furnished with the means of making photographs and casts by the process of M. Lotin de Laval. Copies of these casts were first to be presented to the Smithsonian institution and to the French government, the latter set to be placed in the Trocadero museum at Paris. The story of M. Charnay's travels and successes has been told in the *North American review*, commencing with August, 1880; the editor, Mr. Thorndike Rice, favoring and encouraging the expedition from the first. M. Charnay's moulds having been transported to Paris, he proceeded to make his reproductions. With reference to the Smithsonian series, now being set up in the National museum, Mr. Rice writes, "These casts are duplicates of those now on permanent exhibition at the Trocadero, Paris. The casts have been made in order to afford to students of American antiquities the fullest opportunity for studying these products of indigenous art and the hitherto indecipherable inscriptions." The collection includes a bas-relief from Ocosingo, the stone of Tizoc, fragment from Tezcuco, thirty-eight pieces from Palenque, including the most celebrated sculptures and inscriptions, and thirty-four pieces from Chichen-Itza. M. Hamy will shortly send a detailed account of each piece, and the readers of SCIENCE will receive the benefit of his in-

formation. Professor Baird will have the bas-reliefs of the Temple of the Sun and those of the Temple of the Cross mounted in wooden frames, the exact reproduction of the rooms which they occupied in Palenque. — J. W. P. [170]

EARLY INSTITUTIONS.

The Nottingham records.—The records of the borough of Nottingham have been published by Quaritch in London. They cover the period from 1155 to 1399, and contain much interesting matter bearing upon the history of town customs and government in England. Mr. G. L. Gomme, the author of *Primitive folk-moots*, reviews the volume, and gives us some extracts from it. Assuming that the municipal corporation of the thirteenth century is the primitive village community in a late stage of development, he discovers various customs which he describes as belonging to the primitive village. The history of the primitive village is in this way extended and enlarged. Some very interesting passages, illustrative of the right of pre-emption which kinsmen enjoyed, are given. It appears, that, "if a person sold his land [in Nottingham], his nearest heirs might lawfully enter into such lands and tenements if they offered to the purchaser, in the gild hall of the town, the money which he had given for the property." Some passages bearing upon the history of the open-field system are also cited. Mr. Gomme regards the open-field system as 'the best evidence of the old primitive tenure of land.' The custom of borough English—or 'junior-right,' as Mr. Elton calls it—obtained at Nottingham. — (*The antiquary*, April, 1883.) D. W. R. [171]

NOTES AND NEWS.

It is hoped that the new section for mechanics of the American association for the advancement of science will receive the earnest co-operation of all interested, who may find it convenient to attend. The approaching meeting at Minneapolis will be the second held by the section. Those having matters of interest to present are requested to notify the secretary of section D (A. A. A. S.) at Minneapolis as early as possible. Circulars relating to the meeting may be obtained of the permanent secretary of the association, F. W. Putnam, at Minneapolis.

—During the coming year, experiments will be made at the physical laboratory of Johns Hopkins university with a view to aid in establishing an international unit of electrical resistance. The experiments will be carried on, under the direction of Professor Rowland, with an appropriation from the government of the United States. The results will be communicated to the International commission of electricians, meeting in Paris.

—We alluded a few weeks ago to the award of the first Walker prize of the Boston society of natural history to Mr. Howard Ayres of Fort Smith, Ark., for his memoir on the development of *Oecanthus*. This memoir is now printing by the society. The award of the second prize has now been made. Several papers of unquestionable merit were before the