contains the usual reports of the entomologist, the superintendent of grounds, the botanist, the chemist, and the statistician, besides special reports relating to the diseases of animals and to the boring of artesian wells on the arid lands of the west. The tone and matter of the special reports and of the reports of special character compare so favorably with most of those of the old-style 'regulars,' that the thought suggests itself, that a much larger proportion of the work of the department than has hitherto been customary could best be done by special commissioners outside of Washington and far away from its influences. From the very nature of the situation and surroundings of the Department of agriculture; the irregularity of its income; and its dependence for support upon the favor of political parties, — let alone the merciful dispensation that the tenure of office of its chief is short, — it cannot be accounted competent to carry on continuous scientific researches; and it is in no sense desirable that it should do so. Works of *longue haleine* such as must necessarily run on consecutively from year to year are beyond its powers; and it will be well for Commissioners of agriculture, present and future, to accept the fact. Rather than try to grasp the unattainable, it will assuredly be wiser to study special finite questions as they present themselves; and to this end the best means is the employment of special scientific men of approved competency, each one to grapple with his own particular question in such place and manner as he may deem fit.

One commendable feature of the present volume is the comparative brevity of the reports of the superintendent of grounds and the botanist (of the report of the entomologist we shall speak at another time). The report of the chemist, on the other hand, is extended, and it has somewhat the effect of a twice-told tale. It was interesting and important to prove that the proportion of true sugar in sorghum-stalks increases continually until the plant is well advanced toward maturity; but the evidence of this fact presented in previous reports seemed convincing, and many of the results recorded in the present volume have the effect of being little more than refinements upon good work. The reader is inclined to ask whether it is not about time for the department to let its scientific corps drop sorghum, and to relegate the subject to the artsmen proper; that is to say, to those farmers and manufacturers who are specially interested in this line of business.

From a letter of the 'commissioners for locating artesian wells upon arid and waste lands,' as well as from the statements of the commissioner of agriculture himself, it appears that in their opinion the first trial-well at Fort Lyon in Colorado was not a success. The onus of this 'failure' is made to rest, of course, on the shoulders of a preceding administration; but the lesson it teaches is none the less instructive. It suggests the reflection, that while one important function of the Department of agriculture has been to show the American people 'how not to do it,' there are various ways in which the lesson is enforced. Impracticable borings in Colorado undoubtedly represent one mode of tuition, but in the appointing and changing of employés for political reasons we have another; and to the same end must inevitably work all changes of base which are hasty, spasmodic, and inconsequent. It will be of interest to notice how far down the next borings will be permitted to reach before a new incumbent says, 'Hold, enough!'

From a couple of modestly printed tables on pp. 25 and 692, it appears that the Department of agriculture disbursed $256,129.68 during the year ending June 30, 1881, and $353,748.60 during the year ending June 30, 1882. It will convey no new information, either to scientific men or to the agricultural community, when we say that the results obtained by this class of expenditures have hitherto been, out of all proportion, small.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

The polar quadrilateral. — As a geometrical interpretation of a property of the roots of an equation of the fifth degree, A. Brill shows that the six points in which a conic circumscribing a triangle can be made to osculate a fixed conic are the same for certain five triangles connected with a polar quadrilateral of the fixed conic. — (*Math. ann.*, XX. 331.) C. L. F. [288

Ruled spaces. — In a thesis presented to the Sorbonne, M. Koenigs studies the infinitesimal properties of an extensive class of linear complexes, basing his researches upon the earlier investigations of Plücker, Kummer, etc. M. Koenigs observes, that in punctual space, tangential space, and in space of which the sphere is an element, every infinitesimal property is expressed as a property of involution. He commences by defining certain primordial elements which he regards as necessary and sufficient for the expression of all mutual relations of the infinitesimal prop-

erties of ruled spaces. He defines a point a, and a plane α through this point, as a *couple*, which he indicates by the symbol (a, α). Among the ∞^2 couples situated upon a straight line A (i.e., the point a lies on a straight line A, which is itself contained in the plane α), there is a simple infinity satisfying a given condition; their aggregate constitutes a *correlation*. If this condition consists in the equality of the anharmonic ratios of the four points and the four planes of four arbitrary couples of the correlation, the correlation is said to be *anharmonic*. An important application is made of a theorem of Chasles', concerning the distribution of the tangent planes to ruled surfaces. If $u_1\ u_2\ u_3\ u_4$ are parameters upon which depend a knowledge of a right line (u), and $u_1 + du_1$, etc., those which refer to an infinitely near line $(u+du)$, the vanishing of a homogeneous function of the differentials du expresses a property of the system of lines (u) and $(u+du)$, and, consequently, of the correlation which they determine relatively to one of the group (u). The differentials du, or finite quantities t proportional to them, may be considered as homogeneous co-ordinates of the different anharmonic correlations existing upon the line u. Among these correlations those which destroy one or two kinds of t-co-ordinates constitute, respectively, a *plexus* or a *series* of correlations. These plexi and series replace the cones of elementary directions in punctual space. The condition for the meeting of two lines (u) and $(u+du)$ is expressed by the vanishing of a quadratic form $\mathrm{N}(du)$; and, obviously, all forms such as $\mathrm{KN}(du)$, where K is only a function of the variables u, express the same property. The author remarks that it is possible to choose K in such a manner that the resulting form shall represent the moment of the two lines: i.e., the product of the shortest distance between them by the sine of the angle of their mutual inclination. A number of analogies are here given with punctual spaces. The author makes use of a theorem of Sturm's, concerning pencils of lines; and, particularly, of a method of Darboux', referring to the linear representation of surfaces. A special system of co-ordinates is examined, in which the linear complex possess the properties of spheres; and from this is deduced a system analogous to pentospherical co-ordinates, of which the Plückerian co-ordinates and Klein's sextuply-orthogonal system are particular cases.

The third part of the memoir refers entirely to infinitesimal properties of the second order. The problem treated is an extension of the theory of geodesics, and conducts to a geometrical interpretation of Lipschitz' *normal co-ordinates*. — (*Bull. sc. math., etc.*, 1882.) T. C. [289

PHYSICS.

(*Photography.*)

Photographic halos and reversals. — When a brilliant point of light is photographed, we often find that it is surrounded by a black circle on the negative, whose inner edge is distinctly marked, while its outer shades off imperceptibly into the surrounding regions. Capt. Abney shows that this is not a diffraction phenomenon as has been asserted, but is due to reflection from the back surface of the glass; and that the diameter of the ring depends on the thickness of the glass, and on its critical angle of reflection. All trouble from halos may be avoided by coating the back of the plate with Brunswick black, which reflects back no light to the film.

It is a well-known fact, that, if we greatly over-expose a plate, we shall get a reversal of the image, — the lights taking white, and the shades black, instead of *vice versa* as usual. Now, it has been shown that this is due to the action of the bromine, which has been freed in the lower layers of the film by the action of light, and rises, attacking the metallic silver and sub-bromide in the upper layers. This difficulty is avoided by soaking the film in a solution of potassium nitrite, which absorbs the bromine as fast as it is formed, and before it can do any damage. — (*Brit. journ. phot.*, Jan. 5.) W. H. P. [290

Keeping-qualities of gelatine plates. — Mr. William Brooks has been making some experiments on the keeping-qualities of gelatine plates, and finds, that, though they may work well for a few months, they become slower after that time, the images thinner, and that they develop a tendency to fog. Emulsions were made up with the different silver salts: and it was found that plates coated with the pure bromide of silver would keep well for six months; those coated with bromo-iodide would keep four months; those with bromo-chloro-iodide, three months; and bromo-chloride, two months. The latter plates gave by far the best results when new; but unexposed plates very soon deteriorated, especially if the weather was damp. — (*Brit. journ. phot.*, Feb. 2, 1883.) W. H. P. [291

Lead as an intensifier. — Herr Grebner recommends the following intensifying solution: nitrate of lead, 4 parts; potassium ferricyanide, 6 parts; water, 100 parts. When this solution has acted sufficiently long upon the plate, it is taken out and washed; it is then placed in a mixture of one part of a saturated solution of potassium chromate, and five parts of ammonia, after which it is washed for a short time. If washed too long, the film has a tendency to peel. This formula is applicable to collodion plates. — (*Brit. journ. phot.*, Feb. 2, 1883.) W. H. P. [292

Electricity.

Determination of the ohm. — G. Lippman proposes to measure the resistance of a column of mercury by opposing the current induced by a rotating magnet to another current measured by a galvanometer. Then

$$r = \frac{2\pi n m \mathrm{K}}{\mathrm{K}' \mathrm{H} \tan a};$$

where K is a constant of the electro-magnetic apparatus, m the moment of the magnet, n its velocity of rotation, K′ the galvanometer constant, and H the horizontal resultant of local magnetic forces. $\frac{m}{\mathrm{H}}$ is determined by Gauss's method. The author claims, that in a resistance of one to five ohms the fractional error would be within $\frac{1}{1000}$. — (*Comptes rendus*, xcv. 23.)

Another method, by the same author, is to revolve a coil inside of a bobbin which carries a current passing through the resistance to be measured. The current induced in the revolving coil is opposed to the difference of potential at two points in the resistance to be measured. The condition of equilibrium is $r = 2\pi n \mathrm{C S}$, where n is the velocity of rotation, S the distance between the points of contact, and C a constant of the bobbin. The author gives an experimental method of finding S′, the value which S would assume if the bobbin were extended to infinity in both directions. The value of C for such a bobbin is $4\frac{\pi}{d}$, d being the distance between two turns of the wire. — (*Comptes rendus*, xcv. 26.) J. T. [293

Aërial navigation by electricity. — M. Gaston Tissandier has found that an electric motor of the Siemens pattern, driven by a bichromate battery, the whole not exceeding the weight of three men, is

capable of furnishing regularly for three consecutive hours the work of twelve to fifteen men. A balloon of 900 cub. m. capacity could raise in the air such an apparatus with the additional load of two or three men. M. Tissandier is now engaged in the construction of a gas-generator; after this is completed, he hopes to construct an elongated balloon to which he can apply his machinery. — (*Rev. électr.*, Jan. 27, 1883.) J. T. [294

Cost of electric lighting. — Dr. Siemens, in his address to the London society of arts, showed that arc-lamps were cheaper than incandescent lamps, and that both would be decidedly cheaper than gas-lighting if the electric companies had the opportunity to make sufficiently large plants, and the gas companies continued to pay their present large dividends. — (*Rev. électr.*, Nov. 25, 1882.) J. T. [295

New electric lamp. — Mr. Charles Lever of Manchester has invented and patented an electric lamp in which the carbons are held apart by a spring when no current is passing. The current, when first started, excites an electro-magnet which releases a clip, and allows the upper carbon to fall upon the lower; the weakening of the magnets consequent on shunting the current through the carbons allows the spring to bind the clip, and draw back the upper carbon to the proper distance. When the carbons burn away so as to increase the resistance greatly, this process is repeated. — (*Rev. électr.*, Jan. 6, 1883.) J. T. [296

Electric torpedo-boat. — A torpedo-boat has just been satisfactorily tried at Constantinople, in which a Siemens electro-motor drives two screw propellers in the rear of the boat. The vessel is cigar-shaped, and moves under water at the rate of eight knots an hour. Its path is traced in the day-time by a wire which projects above the surface, and is followed by a telescope; in the night, by a lantern having an opening only towards the shore, and a light too feeble to betray itself to the enemy by reflection. The place in which the torpedo-boat was tried furnished a severe test on account of the strong currents, which vary in direction in different parts of the channel, and in strength from one part of the day to another. The wires conveying the explosive discharge are, of course, distinct from those carrying the motive current. — (*L'Electricité*, Jan. 6, 1883.) J. T. [297

Electro-magnetic theory of light. — J. W. Gibbs continues his mathematical treatment, obtaining in this paper as the general equation of monochromatic light in a medium of any degree of transparency: —

$$\frac{4\pi^2}{p^2} Pot\,[\,U\,]_{Ave} - \nabla\,[\,q\,]_{Ave} = \Phi\,[\,U\,]_{Ave} + \Psi\,[\,\dot{U}\,]_{Ave},$$

where Φ and Ψ denote linear and vector functions; *Pot*, the operation by which the potential of a mass is derived from its density; q, the actual potential; U the electrical displacement; and p, the period of the luminous disturbance. The symbol $[\,]_{Ave}$ denotes a space-average taken through a sphere of unit radius concentric with the point considered. This treatment removes certain objections to the electro-magnetic theory raised by Lorentz and Rayleigh. The equation, however, is not claimed to be rigorously general. — (*Amer. journ. sc.*, Feb., 1883.) J. T. [298

Planetary induction. — M. Quet considers the magnetic induction of the planets on the earth, and obtains

$$\frac{F}{F_1} = \frac{R_1^2 V N p}{R^2 V_1 N_1 p_1} \sqrt{\frac{\cos^2 u - 3h^2 h'^2 - 2hh' \cos u + 4h^2}{\cos^2 u_1 - 3h_1^2 h'^2 - 2h_1 h_1' \cos u_1 + 4h_1^2}};$$

where F and F_1 represent the forces which Jupiter and the sun, for instance, exert on the earth, V the volume, N the angular velocity, p the magnetic power, u the angle of the magnetic axis with the axis of rotation, h and h' the cosines of the angles which these two axes make with the radius vector from the earth's centre. — (*Comptes rendus*, xcv. 23.) J. T. [299

Distortion of the spark by statical electricity. — M. Aug. Righi argues, that the spark of a disruptive discharge ought to be acted upon by neighboring statical charges, as if the spark were a body electrified to the same sign as the electrode whose electric density before discharge is stronger. Experiments in which one electrode of a Holtz machine is connected with the earth, and also where one electrode has a greater curvature than the other, confirm his conclusions. — (*Comptes rendus*, xcv. 24.) J. T. [300

ENGINEERING.

Regulation of rivers, and prevention of floods. — A valuable report upon the rectification of the Rhine and Danube has been made by M. Gustave Wex, privy councillor to the emperor of Austria, in which an account is given of the work carried on between Mannheim and Basle during the period from 1819 to 1863, by which the distance has been shortened from 252 to 169 kilometers, and the fall increased by thirty per cent. The stream has moreover been confined to a uniform channel, the banks being carefully protected, and the old bed with its branches filled, and the land thus reclaimed brought under cultivation. Government considers that the benefits from the change are so large as to make ample payment for the outlay. Similar work upon the Danube has been in progress from 1869 to 1881. The author concludes, that from 48 years of observation and experience of extensive works undertaken for the improvement of rivers, it can be confidently stated that by careful study, even the most tortuous rivers and the swampiest valleys can within a few years yield the most satisfactory results. — (*Van Nostrand's eng. mag.*, Feb., 1883.) G. L. V. [301

The preservation of timber. — A committee of eight members of the Amer. soc. of civil engineers has made a preliminary report upon the above matter, in which a list of thirty-three different chemical processes is presented for preserving wood from decay. The census of 1880 has shown the need of a far more economical use of timber in this country than has prevailed heretofore. Not less than a thousand circulars were sent out to civil engineers, railroad-superintendents, dealers in timber, and chemists; and numerous letters from engineers are given, in regard to the duration of wood under various conditions. — (*Trans. Amer. soc. civ. eng.*, Oct., 1882.) G. L. V. [302

New harbor at Vera Cruz, Mexico. — The plans of Mr. James B. Eads for a new and extensive artificial harbor at Vera Cruz have been for some time before the engineering world, and the work was commenced last autumn. The natural harbor is exposed to gales from the north and north-west, and is often made very dangerous during storms. The plan of Capt. Eads provides for a quiet harbor with deep water and suitable lights for guidance of shipping. The cost of the above works is reckoned at about ten millions of dollars. — (*Engineering*, Nov., 1882.) G. L. V. [303

CHEMISTRY.

(Organic.)

Dianilido-phosphorus hydrate. — Professor Jackson mentioned a Dianilido-phosphorus hydrate ($C_6H_5NH)PO(OH)$, which he and Mr. Menke had obtained by the action of phosphorus trichloride upon aniline. The crude product formed by adding

phosphorus trichloride to aniline was heated over a free flame in a porcelain dish, and the orange-yellow product boiled with alcohol. On adding water a white precipitate of the above composition was thrown down. This substance is not acted upon by aqueous potassium hydrate nor by dilute sulphuric acid, but it is decomposed by strong nitric acid. — (*Harvard chem. club; meeting* Jan. 9.) [304

Phenoxybromacrylic acid.— Professor Hill described phenoxybromacrylic acid which he had obtained by acting upon mucobromic acid with potassium phenolate, and treating with potassium hydrate the product thus obtained. He proposed to study it more carefully with the hope of establishing the relative position of the bromine atoms in mucobromic acid and the connected dibromacrylic and dibrommaleic acids. — (*Ibid; meeting* Jan. 23.) [305

(*Analytical.*)

Quantitative determination of calcium. — Dr. Kinnicutt gave an account of some experiments which he had undertaken with Mr. F. G. Short on the quantitative determination of calcium. Calcium oxalate is precipitated highly crystalline from a boiling solution if it is cooled rapidly, and it may be filtered immediately. In the separation of calcium and magnesium, the calcium oxalate may be filtered without standing, if the formation of an ammonio-magnesium oxalate is prevented by using a small excess of ammonium chloride and by cooling rapidly after precipitation. — (*Ibid.*) [306

Estimation of sulphur in illuminating-gas. — A method proposed by O. Knublauch consists in burning a known volume of the gas, mixed with air, in a glass tube, and absorbing the sulphuric and sulphurous acids in a solution of potassium carbonate. After oxidation of the sulphurous acid with potassium permanganate, the sulphur is calculated from the weight of barium sulphate obtained by precipitation with barium chloride. For details of the method, and description of the apparatus, reference is made to the original article. — (*Zeitschr. anal. chem.*, 1882; also *Berichte deutsch. chem. gesellsch.*, xv. 2403.) C. F. M. [307

Volumetric determination of copper, iron, and antimony by the processes of M. F. Weil. — If a standard solution of stannous chloride is added to a boiling solution of cupric chloride containing sufficient free hydrochloric acid to impart to it a yellow color, complete reduction of the copper solution is indicated by disappearance of the color. A solution of ferric chloride also is rapidly reduced by stannous chloride. In each case the final re-action is so clearly marked that no other indicator is required. When cupric chloride is added to a solution of antimonic chloride in an excess of hydrochloric acid, the mixture acquires a greenish-yellow color. If the quantity of copper is known, by deducting from the volume of tin solution required to reduce the mixture the volume corresponding to the copper, the difference represents the volume of stannous chloride required to reduce the antimonic to antimonious chloride. Copper, iron, and antimony may be determined in the same solution by a combination of these methods. After each series of determinations the tin solution must be restandardized. — (*Revue des mines, Chem. news*, 46, 284.) C. F. M. [308

AGRICULTURE.

Availability of nitrogenous fertilizers. — To obtain an approximate idea of the relative value of different nitrogenous substances as fertilizers, Stutzer and Klinkenberg propose to digest them with an acid solution of pepsin, and determine the proportion of nitrogen soluble in this reagent. They find that a definite proportion of the nitrogen is entirely unacted upon, as Stutzer has previously shown to be the case with fodders; and this portion they consider of little value as a fertilizer. — (*Journ. für landw.*, 30, 363.) H. P. A. [309

Fineness of superphosphates. — In pot experiments with finely ground superphosphate and with the same substance artificially granulated, Wagner finds the former decidedly superior. — (*Biedermann's central-blatt*, 1882, 665.) H. P. A. [310

Clover sickness. — A particular case of 'clover sickness' has been investigated by Kutzleb. It was shown that the failure of the clover was not due to parasites, to lack of nitrogen, to lack of water, or to unfavorable physical properties of the soil. An analysis of the soil showed a decided deficiency of easily soluble potash (soluble in carbonic-acid water), especially in the subsoil, in comparison with the soil of neighboring estates on which clover flourished; and the clover sickness is attributed by the author to this cause. No attempt appears to have been made to test the effect of manuring the field in question with potash. — (*Biedermann's central-blatt*, 1882, 728.) H. P. A. [311

Seed-testing. — Ad. Mayer and Van Pesch suggest various unimportant modifications in the methods of seed-testing in general use in the seed-control stations of Germany. Nobbe comments on these suggestions. A subsequent paper by Nobbe treats of the method to be followed in testing the sprouting power of beet-seed, and of the best manner of expressing the results. — (*Landw. versuchs-stat.*, xxviii. 167, 283.) H. P. A. [312

GEOLOGY.

Induration of rocks by atmospheric action. — Dr. M. E. Wadsworth gave some observations, made in 1871–73, upon the effect of atmospheric action in indurating the friable St. Peters and Potsdam sandstone in Wisconsin. This effect was quite strongly marked upon the exposed surfaces, resulting in induration, the partial obliteration of the granular structure, the formation of concretions, and even of quartz crystals; while the covered portions of the same blocks and slabs retained the usual friable character. — (*Bost. soc. nat. hist.; meeting* Feb. 7.) [313

Glacial phenomena of Mill Rock near New Haven. — Prof. W. P. Blake spoke of the low east-and-west ridge just north of New Haven, and referred its existence to the intrusion of trap-rock in the form of a narrow vertical dike, a part of the East-rock dike. It presents a precipitous front to the south; but northwards the slope is gentle, and is formed of sandstone. This dike of hard trap, and the adjacent hardened sandstone, stood up like a wall in the path of the great glacier; and its surface is strongly rounded off, grooved, polished, and striated by the ice. This cutting is best seen on the surface of the hard sandstone. The direction of the glacier appears to have been from the north-east. In addition to the glacial scratches, there is a series of transverse valleys or depressions having about the same direction. These appear to have been formed by the ice following the lines of outcrop of the harder beds of sandstone underlaid by soft red shales.

Heavy bowlders of hard trap are irregularly distributed in sandy gravel on the north slope. There are some large bowlders of quartz, but granite bowlders do not occur. Most of the bowlders have flattened sides, showing extensive abrasion. They are generally ellipsoidal in form, and are often broken at one

end. The quartz bowlders are found in forms which indicate that they were firmly held in the ice, first in one position, then in another, some of the smaller masses having several facets. A great variety in the nature of the soil is observed. There are deposits of clean sand and of bowlder-clay. These peculiarities, and the abraded bowlders, indicate the *moraine profonde*, or under-moraine. The large pot-holes cleanly cut in the sandstone of the north slope are referred by Prof. Blake to glacial origin, being similar to the 'giants' kettles' of the glaciated regions of Norway, and formed, probably, by vertical torrents falling through the ice-sheet. — (*Conn. acad. arts and sc.; meeting* Jan. 17.) [314

MINERALOGY.

Minerals of the cryolite group. — A note that several minerals of this group, occurring in small quantity, have been identified from a locality near Pike's Peak, Col., by W. Cross and W. F. Hillerbrand of the U.S. geological survey, is of interest. — (*Amer. journ. sc.*, Oct., 1882, 281.) S. L. P. [315

Vesuvianite. — Crystals from Kedalbék (Eastern Caucasia), rich in planes, and brilliant, have been chemically and crystallographically examined. The results of analysis agree closely with the accepted formula $H_2R^{ii}{}_8R^{iv}{}_4Si_7O_{29}$. Four planes new to the species were identified. — (*Zeitschr. krist.*, vii. 344.) S. L. P. [316

Humite. — As the result of the crystallographic study of this mineral from Ludugrufvan (Sweden), Hj. Sjörgren has shown its analogy to the crystallized humite from Vesuvius, though the number of occurring planes is much smaller. The associations of the mineral from this locality is very similar to that occurring at Brewsters, N.Y.; the humite, associated with magnetite, calcite, and brucite, occurring from pure, through all stages of decomposition into serpentine. The pure, unaltered crystals were mostly found imbedded in calcite. In thin sections under the microscope, the appearance is almost identical with that of olivine. The author entering into a discussion of the chemical composition of this, and the closely allied minerals clinohumite and chondrodite, states that the presence of water in all these minerals has often been noted; and, although it fails to appear in most of the published analyses, there is, in most cases, a deficiency of constituents given, in order to make up the full 100 per cent; and this deficiency increases as the quantity of fluorine decreases. Provided this deficiency is due to undetermined water, it might be taken to indicate, that, where there is a deficiency of fluorine, a univalent hydroxyl group enters into the mineral as an isomorphous replacement of a part of the fluorine. Taking this into consideration, and also the varying ratios of Si : R (R=Mg and Fe), he finds that the three minerals agree closely with the following formulae, arranged so as to show their relation to one another and to olivine: olivine, $Mg_{12}[SiO_4]_6$; clinohumite, $Mg_{10}\left[Mg\left(\begin{smallmatrix}OH\\F\end{smallmatrix}\right)\right]_4[SiO_4]_6$; humite, $Mg_9\left[Mg\left(\begin{smallmatrix}OH\\F\end{smallmatrix}\right)\right]_6[SiO_4]_6$; chondrodite, $Mg_8\left[Mg\left(\begin{smallmatrix}OH\\F\end{smallmatrix}\right)_8\right][SiO_4]_6$. These formulae are derived principally by calculation from the older analyses; and it is hoped that more exact analyses may be made to clear up more fully the true chemical nature of these minerals. — (*Zeitschr. krist.*, vii. 344.) S. L. P. [317

Rezbanyite. — Under this name, a new mineral resembling cosalite (2 PbS, Bi_2S_3), but with varying composition, has been described by A. Frenzel. It occurs along with other bismuth and lead minerals at Rezbanya, Hungary: structure, massive, with no decided cleavage; lustre, metallic; streak, black; hardness, 2½–3; gravity, 6.09–6.38. Three independent analyses were made, which led to the formula 4 PbS, 5 Bi_2S_3. — (*Min. und petr. mitth.*, v. 175.) S. L. P. [318

Alloclasile. — This mineral, which occurs at Oravicza (Hungary) in small crystals resembling mispickle, has been newly investigated by A. Frenzel, and shown to be in composition also closely related. On account of the rarity of the crystals, enough of them could not be obtained for analysis; but several analyses from specimens of massive material were made which agreed nearly with the formula (Co Fe) (AsBi) S. It varies from mispickle in that most of the iron has been replaced by cobalt, and part of the arsenic by bismuth. — (*Min. und petr. mitth.*, v. 179.) S. L. P. [319

METEOROLOGY.

Thermal belts of North Carolina. — Professor J. W. Chickering read a paper on this topic, reciting the observations of Mr. Silas McDowell and others. The valley of the Little Tennessee river, in Macon county, is about 2,000 feet above tide. When the thermometer indicates a temperature of about 26° F., the frost extends about 300 feet in vertical height up the mountain-sides, and there ceases, appearing again 400 feet higher. In the intervening belt, the most delicate plants remain untouched; and so sharp are the dividing-lines, that sometimes one half of a shrub may be frost-killed, while the other is unaffected. Following a tributary stream upward from the valley, one passes three mountain-barriers, and enters in succession three valleys, the highest of which is plateau-like, and 3,900 feet in altitude. The vernal zone appears in each valley, rising as the valleys rise, but somewhat less rapidly; so that in the highest it is only 100 feet above the plateau. In this frostless zone the Isabella grape not merely has ripened for twenty-six consecutive years, but is free from mildew, blight, and rust. In Polk county a similar belt is said to skirt the Tryon mountain, extending from 1,200 to 2,200 feet above tide. This is untouched by frost until the latter part of December, and is usually free from snow; while the mountains above and the valleys below are covered. The peculiar stratification of the air indicated by these statements merits scientific investigation. — (*Phil. soc. Washington; meeting* Feb. 24.) [320

GEOGRAPHY.

(*Asia.*)

Riebeck in India. — Dr. Riebeck writes, that after returning with rich collections from Darjiling to Calcutta, where an industrial exhibition gave him opportunity to procure many specimens, he went to Chittagong, and secured in a relatively short time photographs and face-casts of twelve different hill-tribes. A famine in the hill country had driven the suffering people into the British territory, not with any warlike designs as had been reported, but simply to obtain food, mostly rice from the government stores. The poor people often came from twenty-five days' journey beyond the British boundary, and many of them had never seen Europeans before. — (*Verh. gesell. erdk. Berlin*, ix. 1882, 504.) W. M. D. [321

Regel in central Asia. — Dr. Regel reports a number of new geographic details to the Russian geographical society from the region of Karategin and Darwas, about the sources of the Amee River.

The climate is clear and dry in summer; but in the long winter there are heavy snowfalls, preventing communication between the villages. On the way eastward to Karategin, he crossed three nearly meridianal mountain ranges. South-east of the Wakish, the ranges run north-east and south-west; and after crossing the Pandj (Pandsch), the great Badakshan range is fully parallel to the Hindu-Kush. The Wakish, Pandj, and Wandj rivers are respectively 100, 100–170, and 60–100 metres broad. The natives regard the latter two as the true head-waters of the Amee. They both have turbid water, and in winter carry cakes of ice. There are no bridges over the Pandj, and the stream is crossed on goat-skin floats. The population of these villages is very mixed: some of the tribes seem of true Aryan type. For the last fifty years the country has been desolated by wars, in which the prisoners were carried off to be sold as slaves at Buchara, Kashgar, and Badakshan. — (*Verh. ges. erdk. Berlin*, ix. 1882, 505.) W. M. D. [322

(*Africa.*)

New expeditions for eastern Africa. — The geographical society of London has given Mr. Joseph Thomson command of an expedition to enter eastern Africa from Zanzibar, with the object of exploring a direct route to the eastern shores of Victoria Nyanza, and examining Mount Kenia. Thomson left England on Dec. 13. He has previously led two expeditions in this region with excellent success, and a good share of scientific results. He is now preceded in the field by Dr. G. A. Fischer, for whose expedition the Hamburg geographical society has appropriated 15,200 marks. Fischer was to leave Pangani last November, and march toward Liconono, then to the south-eastern shore of Victoria Nyanza, and the little-known Baringo Lake, and, if possible, to go on farther north. Parts of this region have been specially studied by German explorers: Erhardt, Krapf, and Rebmann, in 1848–49; v. d. Decken, Kersten, and Brenner, in 1859 and 1862; Hildebrand, in 1875–77; and Denhardt, and Fischer himself, in 1878. — (*Proc. roy. geog. soc.*, 1883, 32; *Verh. ges. erdk. Berl.*, 1882, 399; *Ausland*, 1882, 978.) W. M. D. [323

Dr. Junker on the Uelle. — This persevering explorer joined an armed Egyptian party a year ago, and followed down the valley of the Uelle, gaining some information about its probable lower course, and returning by a détour to the south and east. It seems that Uelle is simply, as is so often the case, the local word for *river*, and that its name is really Makua; so with its southern branch marked Nomayo on Schweinfurth's map, which should be Bomokandi. Dr. Junker concludes from native information, that the Makua Uelle is the head stream of the Shari; and that the Nepoko, rising farther east and flowing south, is Stanley's Aruwimi branch of the Kongo. He also refers to a large lake south of the region he passed through, and doubtless corresponding to the lake reported from upper Egypt by Lupton; Junker's Makua being presumably the same as Lupton's Bahr el Makwar. — (*Proc. roy. geogr. soc.*, Jan., 1883; *Peterm. mittheil.*, 1882, 424, 441.) W. M. D. [324

BOTANY.

The chromatophor of algae. — While at the zoölogical station in Naples, Prof. Fr. Schmitz studied the arrangement of the coloring matter in the cells of marine algae; and he has since extended his observations to the coloring matter of other groups of plants. At present he gives only the results of his observations on algae, reserving for a future publication his researches on Archegoniata and phaenogams. In a few plants, as the Phycochromaceae, the coloring matter is uniformly diffused through the cell; but in most cases it has a definite outline, and forms a mass to which Prof. Schmitz gives the name of chromatophor. In the higher plants the chromatophor is principally represented by chlorophyl grains; but in algae it is often represented by bands, stellate masses, or large irregularly shaped bodies. Schmitz finds in the chromatophors of many algae more or less spherical bodies to which he gives the name of pyrenoids. They occur in some red and brown algae, and are very common in green algae. Schmitz shows that the chromatophors of algae are capable of division, and that new chromatophors are always formed from some already existing chromatophor and not from the protoplasm itself, using the word in its strict sense. In some cases it appears to be the case that pyrenoids which are in reality nuclei of the chromatophors have been mistaken for the nucleus of the cell itself; as in the case of Anthoceras, where it has been generally supposed the cell nucleus was surrounded by an irregular mass of chlorophyl. — (*Verhandl. natur. vereins Rheinl. u. Westfalens*, 1883.) W. G. F. [325

American Characeae. — The manuscript of the late Alexander Braun, of Berlin, has been edited by Nordstedt, who has added notes and observations of his own; and the whole forms the most complete monograph of the Characeae yet published. In it appear for the first time in print descriptions of several American species which were hitherto only known from herbarium names. The monograph includes one hundred and forty-two species and sub-species. — (*Abhandl. acad. wiss. Berlin*, 1882.) W. G. F. [326

The relations, as regards size, of the wood-cells in Coniferae and other trees. — Dr. Ewald Schulze has repeated the extensive observations of Sanio, and has obtained results which appear to confirm them. He has further shown, that the principles laid down by Sanio may be extended to a much wider range of ligneous plants. — (*Zeitschr. f. naturwiss.*, 1882, no. 3.) G. L. G. [327

Relations of organic matters in the soil to the process of assimilation in the sugar-beet. — The old experiments have been repeated and extended by Corenwinder, but have added very little to what was known before. He states, however, that the beet, when cultivated in a soil very rich in carbonaceous matters, can absorb more or less carbon from that source. As to the use which is made of this carbon, he is unable yet to express a positive opinion; so the question has not been materially affected by his present work. — (*Comptes rendus*, Jan. 2.) G. L. G. [328

Detection of adulterations in tea. — Mayer calls attention to the peculiar character of the felted hairs on the leaves of certain Camellias, and to the universal occurrence of firm cells, which are almost true sclerenchyma, in the parenchyma of the under side of the leaves of tea. The cells are said to be best seen when thin sections of soaked leaves are first treated with dilute potassic hydrate, afterwards washed with alcohol of 50% which contains 10% hydrochloric acid, and finally placed in glycerine and water. — (*Zeitschr. f. naturwiss.*, 1882, no. 3.) G. L. G. [329

(*Fossil plants.*)

Laminarites Legrangei. — Saporta reviews the characters and conformation of this species, described formerly by Saporta and Marion in their work on the Evolution of the vegetable kingdom, p. 101, f. 34. Nathorst of Stockholm had considered it as representing the tracks of animals. From better, very large specimens, Saporta has seen it composed of bands or

lamellae closely placed, and crossed at right angles by others apparently superimposed and of the same nature. He has been able, by separating the layers composing the thallus, to see that these bands anastomosed at their points of conjunction, leaving between them empty spaces of the same width as the bands, composing a kind of latticed thallus like that of species of Agarum. — (*Comptes rendus*, June 26.) L. L. [330

Permian plants from eastern Russia. — After giving a vertical section of the upper Permian of Kargalinsk, Twelvetrees describes a Cardiopteris, two species of Walchia, one Lepidodendron, one Schizodendron, one Anomorrhoea, a Caulopteris (?), and four Calamites. These plants have, taken altogether, a remarkable analogy with a group of vegetable remains procured from strata near Fairplay, Col., and which, by their characters, are of lower Permian age. The affinity is rendered the more remarkable by the fact, that, as remarked by the English author, "The list of the species of plants has a paleozoic aspect, but a secondary one as respects the reptilian remains." The same can be said of fossil remains of Fairplay, the plants being all of paleozoic types; while the insects, according to the researches of Mr. Scudder, are mesozoic. — (*Quart. journ. geol. soc. Lond.*, no. 152.) L. L. [331

ZOÖLOGY.

(*Geographical distribution.*)

The relations of the 'nearctic' region. — A re-examination of Wallace's palaearctic and nearctic regions is being made by A. Heilprin.

Two propositions are discussed: namely, 1°, whether the nearctic region is entitled to independent rank; and, 2°, if not, to which of the two regions, neotropical or palaearctic, does it belong. For the mammals, Wallace's tables are recast. It is shown, that, while eighteen neotropical and nineteen palaearctic families occur in the nearctic region, only eleven genera are common to the nearctic and neotropical regions, as opposed to twenty-one genera common to the latter region and the palaearctic. The number of genera peculiar to the nearctic region amounts to 35 per cent; to the palaearctic, 35 per cent; to the oriental, 46 per cent; to the Australian, 64 per cent; to the Ethiopian, 63 per cent; and to the neotropical, 78 per cent. The number of families peculiar to the nearctic is given as one; to the palaearctic, none; while all the remaining regions have from seven to nine. By uniting the first two regions, the proportion of peculiar genera is raised to fifty per cent, and the number of peculiar families, including Rogiferidae, Alcadae, and Copridae (though without warrant in this case, as it appears to us), to seven, thus bringing the combined regions into rank with remaining divisions of the globe. In conclusion, it is considered proved: "first, that by family, generic, and specific characters, as far as mammals are concerned, the nearctic and palaearctic faunas taken collectively are more clearly defined from any or all the other regions than either the nearctic or palaearctic taken individually; and, second, that by the community of family, generic, and specific characters, the nearctic region is indisputably united to the palaearctic, of which it forms a lateral extension."

It would appear that the first conclusion does not entirely satisfy the first proposition, and that the second conclusion should be reversed; since, according to the percentages given, the palaearctic region is the lateral extension of the nearctic. Among the many thoughts to which the paper (which is not yet completed) gives birth, the following may be recorded: 1°. Even after combining the two northern regions, the interval between their percentage of peculiar genera and that of the region having the next higher number is greater than that between percentage of the palaearctic region alone and that of the region having the next higher number. 2°. The number of families peculiar to the combined regions, according to Wallace's tables (excluding the ungulate subfamilies), is but one more than the number of families peculiar to the nearctic region alone according to Allen's tables. 3°. The character of the peculiar families inhabiting the Australian region is very different from that of those of the other regions, since in the former case six of the eight families belong to one order, while in the latter the families are divided among the many orders of Monodelphia. 4°. A knowledge of what regions are occupied by a group of animals is of more importance to the zoölogist than the knowledge of what animals occupy any region or regions; especially if, in the latter case, no account is taken of extinct forms. — (*Proc. acad. nat. sc. Philad.*, 1882, 316.) F. W. T. [332

(*General physiology and embryology.*)

Action of digitaline on the circulatory organs (preliminary note by H. H. Donaldson and L. T. Stevens). — The continuation of the experiments begun last year has yielded the following results: the work done by the heart of the common frog is decreased by digitaline, whatever the dose, as was previously shown to be the case for the heart of the 'slider' terrapin. In both frog and terrapin, the decrease occurs, whether the aörtic valves are intact or not. Variations in arterial or venous pressure do not affect the result.

By a method permitting direct measurement of the fluid circulating through the viscera and lower extremities in a unit of time and under constant pressure, it has been determined for the frog that the arterioles are constricted by digitaline. On this point the terrapin has not yet been investigated. Digitaline has also been shown to increase mean blood pressure in both frog and terrapin.

We have, then, for the frog under digitaline a decrease in the work done by the heart, a rise of mean blood pressure, and a constriction of the arterioles. The first and second of these points have been already demonstrated for the terrapin as well. — (*Johns Hopk. univ. circ.*, Feb., 1883.) [333

Origin of the heart. — Professor Bütschli has advanced a hypothesis of the phylogenetic origin of the heart and blood-vessels, which has much plausibility. He suggests that the heart is a remnant of the primitive or segmentation cavity of the embryo, and is not derived from the secondary or permanent body cavity (schizocoele or enterocoele). He endeavors to reconcile this view with the accounts of the development of the heart in vertebrates, maintaining that it probably arises as a fissure in the mesoderm, remaining as a permanent part from the temporary primitive cavity. More support for the hypothesis is found in arthropods; for it has been observed in several forms that the two edges of the mesoderm approach one another in the median dorsal line, leaving a space between them, which belongs to the primitive cavity. This space becomes the heart. Sometimes it is cut off before, sometimes after, the mesoderm is split into segments. These observations were upon the bee (Bütschli), Geophilus (Metschnikoff), and Branchipus (Claus). An investigation to answer the problem propounded by Bütschli would, it may be safely said, prove fruitful and interesting. — (*Morph. jahrbuch*, viii. 474.) C. S. M. [334

Mollusks.

Anodonta fluviatilis. — Dr. Jos. Leidy directed attention to a basketful of living fresh-water mussels, Anodonta fluviatilis, collected from ponds in the marl of New Jersey. He had found them on examination to be exceedingly prolific. The pregnant females have the branchial uteri, as they have been appropriately named by Dr. Isaac Lea, enormously distended with perfected embryos. These appear with a cinnamon-brown shell having a conspicuous spinous tooth or hook to each valve, and are provided with long byssal threads. Wishing to ascertain the proportionate amount of embryos, the following calculation was made: in an individual six inches long, the soft parts were weighed, and found to be 135.44 grammes. The branchial uteri weighed 64 grammes, and the inner gills 7.34 grammes. Supposing the latter to be of the same weight as the outer gills free from embryos, this weight subtracted would leave 56.66 grammes as that of the embryos, and 78.78 grammes as the weight of the rest of the animal. He estimated that there are 1,280,000 young in the branchial uteri of each animal.

The mussels were infested with many water mites creeping about among the gills, and the young of the same were found embedded in the mantle. The mite appears to be identical with the Atax ypsilophorus described one hundred years ago by Bonz, as infesting the Anodonta cygnea of Europe. It is of a dense black color, with a Y-shaped yellow mark on the back. Our Unio complanatus had been found infested with a mite which is probably the Atax Bonzi described by Claparede from European unios. If our parasitic mites are identical with those of European mussels, it not only makes it appear probable that they are of common origin, but renders it the more probable that this is likewise the case with their hosts, even if these are not regarded of the same species. — (*Acad. nat. sc. Philad.; meeting* Feb. 13.) [335

Insects.

Luminosity of fire-flies. — Considering the popular interest in the subject, we have very few investigations of the light-giving organs of insects; but for all this, as the latest student of their anatomy, Heinrich Ritter v. Wielowiejski, observes, there are plenty of contradictory statements.

The photogenic organs, as Huxley calls them, consist of thin whitish plates, resting on the ventral walls of the penultimate and antipenultimate abdominal rings of the abdomen, which is in these spots transparent to allow the emission of the light. In the female glow-worm there are also two small accessory light-organs in the last ring. These photogenic plates are composed of 'parenchymal cells,' richly supplied with nerves and tracheae. The upper and lower strata of the plates, considered as distinct by former authors, really differ only in the nature of the contents of the parenchymal cells above and below. These cells are morphological equivalents of the 'fat-body' (as maintained by Leydig), and physiologically are glandular. The production of light results from the slow oxidization of materials formed, under control of the nervous system, by the parenchymal cells. The light may continue to shine long after the death of the cells, and therefore is not a property of the living protoplasm as such.

The stellate 'terminal tracheal cells' discovered by Schultze have no connection with the production of light, nor are they the ends of tracheae. They belong, in fact, to the matrix, or peritoneal sheath, of the tracheae, which is spread out about the point where the fine tracheae branch into still finer 'tracheal capillaries,' which latter want the spiral threads of the tracheal stems. The 'capillaries' seldom end blindly, but anastomose with each other into a sort of network. They do not penetrate into the parenchymal cells, but seem to run over their surface, twining irregularly around them on all sides. Some (or all?) of the parenchymal cells are connected with fine nervelets.

The most useful reagent for the study of the light-organs was a solution of osmic acid (from 1 to 0.1 per cent) in which the living insects were immersed, and later transferred to alcohol, or to a mixture of alcohol, glycerine, and water.

The eggs were found not to shine by their own light, but as stated by Newport, though he has been contradicted by Owsjannikow, are sometimes rendered luminous by an accidental coating of the luminous substance of the light-giving organs, which might easily be ruptured by the pressure of the masses of eggs contained in the abdomen of a gravid female.

While the luminosity of the adult fire-flies is evidently useful in bringing the sexes together, it remains to explain the luminosity of the larvae and pupae, which are thus of course made conspicuous to the eyes of insectivorous birds and other animals. Von Wielowiejski suggests that their bite, already known to be poisonous to the snails on which the young fire-flies feed, is to some extent poisonous to the enemies of the latter. If this is the case, or if, as it may be suggested, they are disagreeable to the taste, the light would of course serve as a danger-signal to protect its givers from attack.

The author finally calls attention to larval or embryonic characteristics found in adult Lampyridae. Besides the well-known larval form of the adult female glow-worm, the 'terminal tracheal cells' are embryonic structures. There is also the occasional occurrence, on the muscular fibres, of remains of the embryonic formative cells, and the presence of the large free cells in the body cavity.

The paper appears to be the result of careful and reliable study, and, if somewhat diffuse, is still a most valuable contribution to our knowledge of a difficult subject: it contains, besides the points already mentioned, a number of observations on the fat-body, nervous system, cuticula, etc. — (*Zeitschr. wiss. zool.*, xxxvii. 354.) E. B. [336

VERTEBRATES.

Integumentary appendages. — Mr. J. A. Jeffries spoke of the structure of these parts in birds, and compared these with each other and the appendages of other vertebrate groups. Having stated that the same layers of the epiderm could be found in the development of all the appendages, and that many of the layers seemed to be the result of physiological conditions rather than of morphological value, he passed to a comparison of the appendages.

Feathers differ from the scutae of the tarsus in that the internal surface of the mucous layer becomes exposed to the air; they arise as hemispherical knobs, not as folds; they may grow upon the scutae; and the final structures are totally distinct. The supposed scale-like nature of penguin-feathers has, moreover, been proved to be a fallacy.

Scutae are separated from the scales of reptiles, with which they have have been assumed *a priori* to be homologous, in that they arise as folds; they have not the complex structure of scales, they shade into the papillae of the plantar surface of the toes, and they may bear feathers. Finally, any point of resemblance between feathers and scales also exists between the two, and the folds on the tail of the rat or opos-

sum; in fact, there is very little difference between the first and the last; yet one would hesitate to call the folds on the opossum's tail scales.

The claws are shown by their positions, structure, and development to be homologous with those of other vertebrates. Wattles, spurs, and the bill seem to be special formations.

Mr. Jeffries finally stated that he had been unable to find any resemblance between the papillae in the mouth and feathers; the papillae being comparable with those of other vertebrates, and the jelliform structure found in the ducks being due to a lack of development of certain epithelial cells. — (*Bost. soc. nat. hist.; meeting* Feb. 7.) [337

Motor disturbances following lesions of the internal ear. — Operative difficulties have hitherto prevented any extended series of experiments on mammalia in this connection. Vulpian has lately employed the method of injecting irritating liquids into the external auditory meatus of rabbits. A few drops of a 25 per cent solution of chloral hydrate in water, when injected, cause motor disturbances within fifteen minutes; these become more pronounced, and next day attain a maximum; the limbs are moved with uncertainty in locomotion, and the animal frequently falls; the head is twisted on the spinal column so that the cheek of the side on which the injection was made is turned upwards; there are circus movements towards the side of the operation; the animal rolls over and over around its longitudinal axis; there is nystagmus; and also the muscles of the two eyeballs cease to be co-ordinated in their action, so that one eye is turned upward and the other towards the ground. Post-mortem examination showed no lesion in the brain cavity, but destruction of the labyrinth so extensive that no statement as to any specific connection of any one part of the internal ear with the motor disturbances could be made. The phenomena are much less marked when dogs are substituted for rabbits. — (*Comptes rendus*, cxvi. 1883, 90.) H. N. M. [338

Reptiles.

The carpal bones of Dinocerata. — During a communication on the tarsus and carpus of the Dinocerata, Mr. Jacob L. Wortman referred to Prof. Marsh's statement, that the scaphoides in the proximal row of the carpus is supported below by the trapezium and trapezoides, and that it does not touch the magnum. In the figure of the anterior foot, however, which Prof. Marsh published with this description, he makes the scaphoides to articulate with the magnum, although stating directly to the contrary. The speaker had recently made a careful study of the remains of Uintatherium, belonging to Princeton college, and had found that the scaphoides does touch the magnum; thereby establishing the fact that Prof. Marsh's figure is right, although his description is wrong. The carpal bones, therefore, of the proximal and distal rows form distinct interlocking series; indicating that the Dinocerata can no longer remain as a sub-order of the Amblypoda, but must be placed in the Diplarthra of Cope, which includes the Artiodactyla and Perissodactyla, and corresponds with the Ungulata of authors. — (*Acad. nat. sc. Philad.; meeting* Feb. 20.) [339

ANTHROPOLOGY.

Aborigines of Andaman islands. — In our childhood we imbibe the opinion that African and Negro are co-extensive; but ethnology acquaints us with these two propositions, — not all Africans are Negroes, and, not all Negroes are Africans. The natives of the Andaman islands, off the west coast of Farther India, are a woolly-haired black race, like the negrittos of Malacca and the Philippines. Mr. E. H. Man, who has lived among them, has been giving to the British anthropological society a series of sketches concerning them, the last of which appeared in a late number of the journal. Many precious facts respecting their language are presented. For instance, they coin native compounds for new ideas: as, *âr'la*, daily, and *ik-yâ'b*, repetition, for prayer. They have a poetic dialect that subordinates to rhythm the forms of words, and even sentential structure. A very elaborate system of possessive pronominals is in use. There are, of these, three principal classes: 1, for nouns denoting human objects; 2, for names of parts of the body; 3, nouns of relationship. Again, No. 2, has seven subclasses: I. Used with names for head, brain, neck, chest, heart, etc. II. With hand and foot, and their parts. III. With shoulder, arm, breast, face, temple, etc. IV. With body, back, thigh, calf, elbow, stomach, liver, etc. V. With leg, hip, loin, bladder, etc. VI. With mouth, chin, lip, throat, etc. VII. Only with waist. Class 3 has eight subdivisions.

The word-construction is both prepositional and postpositional; so much so that the two forms interfere with each other's grammatic function.

Owing to a singular practice of adoption, it is rare to see a child above six or seven years residing with its parents. It is considered a compliment for a married man, after a visit, to ask his host for one of his children. Indeed, the *soi-disant* father, may, on a similar occasion, pass the child on farther, without referring to the real parent. To prevent improper flirtations among the lads and lassies, they paint the suspected parties, one red, the other white: of course they cannot mutually embrace without partially exchanging color. Marriage is forbidden among near relatives. Relationships are traced in both lines, and the system with reference to either sex is identical; but the record fails after three generations.

Children are named before they are born, after some friend of the parent; there being no distinction of sex in these titles. As they grow up, a male or female affix is applied. At puberty the females receive the 'flower' name, after a plant blooming in the month when that takes place. The young men receive an epithet name. Between the eleventh and the thirteenth years commences the initiatory abstinence from turtle, honey, pork, fish, and other *choses défendues;* which lasts for a period of years, and is broken at last with great ceremony and rejoicing. Mr. Man takes occasion to correct a great many marvellous stories about the unchastity and inconstancy of the Andamanese, and paints a very pretty picture of their simplicity and fidelity in matrimonial matters. The marriage-ceremony is described in charming style.

Much ceremony is practised in the burial of the dead; infants being deposited under the hearth of the hut where they died, and adults upon a 'machan,' or platform, in the jungle, or in a grave. Temporary migrations in either case follow death, in order to allow the spirit of the deceased full range around the old haunts. After a proper time the dead are exhumed, their bones cleaned and made into jewelry and mementos. The belief in spirits is evident from the ceremonies accompanying interments.

Friends, at meeting, stare at each other until the younger speaks; relatives embrace, and howl hideously. For each particular kind of meeting there is a special form of salutation, in which tears form the chief ingredient.

Fire-making is unknown; but the modes of pre-

serving the fire furnished by the active volcano of one of the islands are very ingenious. Many misstatements have been made concerning their former ignorance of fire.

The closing part of Mr. Man's paper, relating to superstitions, beliefs, and mythology, furnishes a tempting field for the prolongation of this notice; but the want of space forbids. — (*Journ. anthrop. inst. Gr. Br.*, xii. 117.) [340

The Papuans and the Polynesians. — Students of ethnology are astonished and perplexed at the occurrence of a patch of mop-headed blacks occurring in the oceanic area that extends south-easterly from New Guinea to Fiji, and various have been the attempts to classify them. Mr. A. H. Keane has elaborated a scheme of all the oceanic peoples in the ethnologic appendix to Stanford's Compendium for Australasia. To this arrangement Mr. C. Staniland Wake takes exception, in a paper read before the London anthropological institute, which called forth a sharp rejoinder from Mr. Keane. Mr. Wake's own views may be briefly stated: —

1. The Eastern Archipelago was early inhabited by a straight-haired Caucasian race, represented by the Australians. 2. To this race belonged also ancestors of the Papuans, Micronesians, Tasmanians, and Polynesians. 3. The special peculiarities of the dark races are due to foreign elements, the Negritos having influenced them all in varying degrees. 4. The lighter races show Negrito influence, but they have been intermixed with Asiatic peoples, giving rise to the Malay and the Polynesians. 5. Traces of an Arab or Semitic element appear among all, but chiefly among the Papuans and Melanesians, the former of whom may also possess a Hindoo admixture. — (*Journ. anthrop. inst.*, xii. 197.) [341

Pebbles resembling artificial objects. — Dr. Jos. Leidy called attention to a collection of large pebbles, which illustrated how closely certain natural forms may sometimes resemble works of primitive manufacture. The pebbles have the general shape of human feet, and might readily be supposed to have been used as lasts upon which the moccasins or sandals of prehistoric man were shaped. — (*Acad. nat. sc. Philad.; meeting* Feb. 5.) [342

PSYCHOLOGY.

Apparent size of magnified objects. — A paper (to appear elsewhere) was read by Prof. W. H. Brewer, in which he gave the results of several hundred estimates by as many different observers chosen from different classes of people, of a common insect as seen magnified by a microscope. These estimates were found to vary from a fraction of an inch to several feet, the actual apparent size at ten inches being a little over four inches. — (*Conn. acad. arts sc.; meeting*, Dec. 20.) [343

Experiments in binary arithmetic. — Simple addition involves several distinct but nearly simultaneous mental operations, and a capital of more than fifty propositions committed to memory. The object of the experiments by the author of the paper, Mr. Henry Farquhar, was to test the possibility of diminishing the mental strain, and consequent liability to error, by the use of numbers expressed in powers of 2, the mental work being reduced to counting similar marks and halving their sums. Columns of numbers of six or eight figures each were written with the ordinary, and with various forms of binary, notation; and comparative additions were made. To avoid confusion of columns it was found best to give different shapes to the marks denoting neighboring powers of 2; and, for brevity of expression, two or more of them were combined in one written figure. About seventy combinations were tried, with various results. With the best combination, addition required only three-fourths the time taken with ordinary figures; and this was reduced to one-half when the binary notation was taught to a person unskilled in arithmetic.

The only natural division is by bisections; hence the superior convenience of a binary scale of weights; and hence another reason for endeavoring to introduce a binary arithmetic.

In the discussion which followed, Mr. William B. Taylor said the world was losing so much by the use of the denary arithmetic, that even a single generation might find economy in substituting the octonary. The paper had especial value in that it proved the ability of binary arithmetic to compete with the established system in rapidity of computation. — (*Phil. soc. Wash.*; *meeting* Jan. 13.) [344

Varying the thermal background of reflex perception. — The background of conscious perception, physiologically speaking, is defined by W. T. Sedgwick as "that standard (usually unconsciously held) with which we compare any stimulus which awakens consciousness." We perceive difference of relative intensity between a specific stimulus and its background. The latter may vary so that a stimulus which will to-day cause consciousness or motion will not do so to-morrow. Instead of studying the reflex background by means of inhibitions, the author varies the background as a whole thermally, and observes its effect on reflexes. A reflex or headless frog may be heated so slowly, that, although the heart may beat very fast, *rigor caloris* may be caused without any motor re-action of its limbs. If the heart be tied beforehand, reflexes occur from gradual heating.

This the author thinks explained by assuming, that, in the first case, the hot blood passing inward equalizes the progressive heating throughout, or changes the thermal background; while in the second case, with no circulation, the background is fixed, and the surface temperature rises to the point of difference which causes movement. — (*Johns Hopk. univ. circ.*, Feb., 1883.) G. S. H. [345

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

National museum.

Manitoba fishes. — A collection of fishes from Manitoba, the first received for twenty years, shows that the fish-fauna of that region does not differ materially from that of the lake states.

Number of visitors in 1882. — The reports of the doorkeepers, which have been regularly made since Feb. 8, 1882, show that the average daily attendance at the museum building for that year was 535 persons, and, at the Smithsonian building, 488 persons. Estimating upon this basis, the attendance for the year 1882 may be placed at 183,265 for the museum building, and 152,822 for the Smithsonian building. When the re-arrangement of the collections in the latter