the specific descriptions, it appears to us that Mr. Herrick trusts too much to such characters as the number and arrangement of the joints of the antennae, which change with the growth of the individual. Even sexual maturity in these animals does not determine the limit of structural change.

Besides the microscopic forms, two species of cray-fish are recorded, — Cambarus virilis Hagen and C. signifer sp. nov. Attention is again drawn to the curious fact that size does not govern the transition from the 'second form' or sexually immature (?) male to the 'first form' or perfected state; the second form often exceeding the first in its dimensions. Zoölogists whose lot it is to live in a cray-fish country cannot be too strongly urged to study the habits and physiology of these so-called dimorphic males. Types of the 'new' species, C. signifer, kindly communicated by Mr. Herrick, prove to be C. immunis Hagen. Eleven plates accompany this memoir.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Quadrature of the circle. — In vol. xx. of the Mathematische annalen, Lindemann gave a proof of the fact that π cannot be a root of an equation of any degree with rational co-efficients. This is a most remarkable paper, as it thus contains the first direct, absolute proof that has ever been given of the impossibility of the quadrature of the circle. M. Lindemann's investigation is based upon, and presupposes a knowledge of, Hermite's earlier paper, in which he showed that e, the Napierian base, cannot be the root of an equation with rational co-efficients. The fact that Lindemann has started from Hermite's results makes his paper rather hard reading; and on this account, the author of the article at present referred to, M. Rouché, has thought it worth while to give an account of the work done by Hermite, and more recently by Lindemann, and at the same time to simplify the processes in both cases. M. Rouché has really done very little in the way of simplification, but by bringing together the proofs he has produced an interesting and valuable paper. He professes the belief that the last word has not yet been said on the subject, but that another and simpler proof will yet be given of the fact that π cannot be a root of any equation of any degree with rational co-efficients. Lindemann has certainly done a splendid piece of work in thus absolutely proving the impossibility of 'squaring the circle;' and it is only to be regretted that his work will not carry conviction to the minds of those mistaken individuals, the 'circle-squarers.' But it is hardly to be supposed that they will be convinced of the futility of their task, any more than the perpetual-motion inventors were convinced by the discovery and enunciation of the principles of the conservation of energy. — (*Nouv. annales*, Jan., 1883.) T. C. [1

Geodesic lines. — The author, Herr A. v. Braunmühl, considers the case of geodesics upon triaxial surfaces of the second order. He derives first Weiertrass' formulas for a general geodesic, and obtains forms for the entering constants in terms of the double *theta*-functions, rendering them easy of computation. Examples are given of the computation of geodesic lines in the general and in several special cases. The latter, and newer part of the paper, contains a derivation of the equations of the envelopes of geodesics, and a discussion of the same. The envelope is determined by aid of the hyperelliptic functions, and special applications are made to the ellipsoid and two sheeted hyperboloid. Numerous references are given to previous investigations. — (*Math. annalen*, xx., 1882.) T. C. [2

Abelian and theta functions. — Prof. Cayley in this memoir has reproduced with additional developments the course of lectures which he delivered in the Johns Hopkins University, in the winter and spring of 1882. The memoir has a special interest as being the first of any consequence upon this subject in the English language, and, indeed, one of the most important in any language. The chief addition to the theory consists in the determination made for the cubic curve, and also (but not as yet in a perfect form) for the quartic curve of the differential expression $d\Pi_{\xi\eta}$ (in Clebsch and Gordan's notation) or $d\Pi_{12}$ (in Prof. Cayley's notation) in the integral of the third kind $\int_a^\beta d\Pi_{\xi\eta}$ in the final normal form for which $\int_a^\beta d\Pi_{\xi\eta} = \int_\xi^\eta d\Pi_{\alpha\beta}$ the limits and parametric points interchangeable. The notation and demonstrations of Clebsch and Gordan are much simplified, and the theory is illustrated by examples, in regard to the cubic, the nodal quartic, and the general quartic respectively. The first three chapters only of the memoir have yet appeared. — (*Amer. journ. math.*, v., 1883.) T. C. [3

PHYSICS.

Acoustics.

Instrument for measuring the intensity of aërial vibrations. — The instrument is based on an experiment described by the author (Lord Rayleigh) in the Proceedings of the Cambridge philosophical society for November, 1880; from which it appeared that a light disk, capable of moving about a vertical diameter, tends to set itself at right angles to the direction of alternating aërial currents. A brass tube is closed at one end with a glass plate, behind which is a slit through which pass rays of light from a lamp. A light mirror with attached magnets, such as are used for reflecting galvanometers, is suspended by a fine silk fibre so that the light from the slit is incident upon it at an angle of 45°, and, after reflection, passes out through the side of the tube by a glass window. A lens is so placed as to throw an image of the slit upon a scale. The opposite end of the tube, prolonged to a distance equal to that between the slit and mirror, is closed by a diaphragm of tissue-paper. A sliding tube extends for some distance beyond this. If the instrument is exposed to sounds whose half-wave-length is equal to the distance from the slit to the tissue-paper diaphragm, nodes are formed at each

end of the tube, and the mirror, being half-way between these, is at a loop. Hence it tends to set itself at right angles to the vibratory motion. This tendency is opposed by the magnetic forces; but the image on the scale shifts its position through a distance proportional to the intensity of the action. The instrument reveals an enormous disproportion between sounds which, when heard consecutively, appear to be of the same order of magnitude. — (*Phil. mag.*, Sept., 1882.) C. R. C. [4

Optics.

Absorption spectra of ozone and pernitric acid. — The places of eleven absorption bands due to ozone are catalogued by M. J. Chappuis according to wave-length. Of these, by far the most intense are those having the limits $\lambda = 609.3$ to 593.5 and $\lambda = 577.0$ to 560.0, which are Nos. 2 and 3 of the table; next in intensity is $\lambda = 535.0$ to 527.0, which is No. 5 of the table. These bands were observed in light which had traversed a tube 4.5 m. long, containing ozonized oxygen prepared at the atmospheric pressure and a temperature of 15° C. Variations of length of tube and pressure of gas were accompanied by a variation in the intensity of the absorption bands, such that the effect produced seemed proportional to the quantity of ozone traversed by the light. A lowering of temperature, however, produced, independently of change in density, an increased intensity of the bands. M. Chappuis succeeded also in observing the absorption spectrum of the blue liquid which is obtained by compressing a mixture of carbon dioxide and ozone, in which he found the two characteristic bands Nos. 2 and 3 near D; the absence of the others being attributed to the small quantity of the liquid used.

If the smallest quantity of nitrogen were present in the tube, other bands of a greater intensity appeared, which M. Hautefeuille and the author were led to attribute to an oxygen compound of nitrogen richer in oxygen than nitric acid, and to which they gave the name pernitric acid. The stronger of the bands were readily seen in a tube no longer than 0.1 m. The eight bands attributable to this substance are tabulated and described.

In the second part of his paper, the author gives a discussion of the bearing of his discoveries on the telluric lines of the solar spectrum, with the conviction that the lines 2, 3, and 5 of the ozone spectrum are present in the spectrum of the sun when at the horizon. That a part of the cause of the blue color of the sky is the presence of ozone, is also indicated. — (*Journ. de phys.*, Nov., 1882.) C. S. H. [5

Reflection of 'actinic' rays. — M. de Chardonnet finds that silver alone, of a large number of solid and liquid bodies, exerts an elective absorption on light of short wave-length. Polishing a body does not alter its action. — (*Journ. de phys.*, Dec., 1882.) C. S. H. [6

Saccharimeter. — Note by M. H. Dufet on M. Laurent's recent modification of his form of saccharimeter, by adding an absorbing plate of bichromate of potash, whereby a source of white light may be used. — (*Journ. de phys.*, Dec., 1882.) C. S. H. [7

(*Photometry.*)

Stellar photometry. — In a discussion of the accuracy attainable by the use of a neutral-tint wedge of glass for the determination of stellar magnitudes, Prof. Pritchard finds that careful measures ought not to be in error more than one-thirteenth of a magnitude. He also finds reason to believe that the ordinarily assumed law, that the brightness of a star is directly proportional to the square of the aperture of the observing telescope, may lead to sensible errors. The paper contains a table of differences of magnitudes, as determined by himself, compared with the same quantities derived from the Harvard observatory. — (*Month. not. roy. astr. soc.*, Nov., 1882.) C. S. H. [8

Photometric measurements of the sun, moon, and electric light. — According to the measurements of Pouillet, the sun is radiating 7,000 horse-power per square foot of its surface, or 50 horse-power per square inch. Sir William Thomson states that the normal current through a Swan lamp giving 20 candle-power is 1.4 amperes, with a potential of 40 to 45 volts. Hence the actual work is 61.6 ampere-volts, or watts (so-called). Dividing by 746, we find .085 horse-power for the electric activity in a Swan lamp. The filament is 3.5 inches long, and .01 inch in diameter: hence the area of the surface is .11 of a square inch, and the activity at the rate of .75 horse-power per square inch. Therefore the activity of the sun's radiation is about 67 times greater than that of a Swan lamp for an equal area.

An experiment on sunlight compared with an observation on moonlight made by our author, has led him to conclude that the surface of the moon radiates something not enormously different from one-third of the light incident upon it. The moonlight at the time and place of the observation (York, early in September, 1881, about midnight, near the time of full moon) was found to be equal to that of a candle at a distance of 230 centimetres. The luminous intensity of a cloudy sky was found, about 10 A.M. in York, during the meeting of the British association, to be such that light from it through an aperture of one inch area is equal to about one candle.

An experiment on sunlight last December showed, at one o'clock, the sunlight reaching the author's house to be of such brilliancy, that the amount coming through a pinhole in a piece of paper .09 of a centimetre diameter produced an illumination equal to that of 126 candles. The area of the candle-flame was 2.7 square centimetres, or 420 times the area of the pinhole, and therefore the intensity of the sun's light was equal to 126×420, or about 53,000 that of a candle-flame. — (*Electr. review*, Dec. 23, 1882.)

Sir W. Thomson's first calculation showing that a Swan lamp giving out 20 candle-power uses up only $\frac{1}{67}$ the amount of energy of the sun for the same unit of surface is interesting; but, if we include the question of the light obtained, quite a different result will be reached. The total area of the carbon filament, as we have seen, is .11 of an inch; but only half of this, or .055 inch (equal to .36 centimetre), can be seen at once; and this gives out 20 candle-power. The area of the pinhole in the last observation was .0063 square centimetre, and gave out 126 candle-power. Hence $\frac{.36}{.0063} \times \frac{1}{20} = 359$, — the intrinsic brilliancy of the sun in terms of the Swan light. The sun therefore radiates 67 times the energy, but 359 times the light, of the Swan lamp, or 5.4 times the light for every horse-power expended.

In May, 1879, the writer conducted some observations on this subject (*Proc. Amer. acad.*, 1880, xv. 236), by which it was found on one occasion that the total brilliancy of the sun, when at an altitude of 25°, was 64,700 candle-power at one metre's distance; and another time, when at an altitude of 40°, 82,000 candle-power. The apparent area of the sun's disc at this distance would be .68 centimetres; and assuming that the area of the candle flame in this instance was 2.7 centimetres, which could not be very

far out of the way, we have the intensity of the light from the sun's disc in the two instances, $\frac{2.7}{68} \times 64{,}700 = 257{,}000$, and 326,000 instead of 53,000, times that of the candle.

In our author's observation the altitude of the sun could not have been far from 12°; which, together with the greater clearness of the American skies, may have produced the large discrepancies in our results. But assuming my results to be correct, even at an altitude of 40° the sun gives out 33 times the light of a Swan lamp for the same amount of power expended. — W. H. P. [9

(Photography)

Green fog. — A possible explanation of this difficulty is offered by Mr. E. Dunmore, who thinks it is due to the action on carbolic acid by ammonia, converting it into aniline. Both substances are generally present in an emulsion prepared with ammonia; and, with regard to an acid-boiled emulsion, the gelatine may of itself contain them, — the ammonia from incipient decomposition, and the carbolic acid from what has been used to preserve it from putrefaction during manufacture. — (*Brit. journ. phot.*, Dec. 1, 1882.) W. H. P. [10

Cold emulsification. — Mr. A. F. Genlain describes his method of carrying out Mr. Henderson's formula for cold emulsification. He thinks that by discarding the carbonate of ammonia, as Mr. Henderson has since suggested, this will prove one of the most certain processes yet discovered. — (*Brit. journ. phot.*, Dec. 15, 1882.) W. H. P. [11

A modified gelatine emulsion. — Mr. W. K. Burton employs a process by which, in the results obtained, the density of the negative will increase nearly proportionally to the amount of light received. By the ammonia process the density increases too rapidly at first, while in the long boiled emulsion the increase is too slow. But the great advantage which he claims lies in the fact that the gelatine which has gone through the ordeal of the operation necessary to obtain sensitiveness is eliminated. It is this gelatine which he thinks gives rise to many of the evil phenomena which gelatine plates exhibit, especially when ammonia is used. — (*Brit. journ. phot.*, Dec. 15, 1882.) W. H. P. [12

CHEMISTRY.

(General, physical, and inorganic.)

Lecture experiments. — Dr. A. W. Hoffmann has devised a series of lecture experiments similar in principle to those described in his Einleitung in die moderne chemie. The electrolysis and formation of hydrochloric acid are illustrated in a simple manner, and several improvements are introduced into experiments illustrating the phenomena of combustion. Some experiments on the volumetric relations of gases are suggested, and the analysis of ammonia gas is made less tedious in its details. A new form of apparatus is described, which is intended to give an experimental illustration of the law of Dulong and Petit. — (*Berichte deutsch. chem. gesellsch.*, xv. 2656.) C. F. M. [13

Lecture experiments with zinc-dust and sulphur. — In the experiment which is usually performed to illustrate chemical combination, instead of heating sulphur with copper or iron filings, Schwarz makes an intimate mixture of sulphur and zinc-dust, and ignites it with a match. It burns like gunpowder, with a bright greenish flame, leaving a residue of zinc sulphide. When heated in a retort with carbonic disulphide, zinc-dust is converted into the sulphide, and carbon separates in the form of soot. Many complex organic compounds containing sulphur are decomposed when heated with zinc-dust with the formation of zinc sulphide and carbon compounds of a simpler order. — (*Berichte deutsch. chem. gesellsch.*, xv. 2505.) C. F. M. [14

Preparation of oxygen at ordinary temperatures. — When potassium permanganate is mixed with concentrated nitric acid, M. Guyard finds that oxygen is liberated from the permanganic acid with great regularity, and the action continues until two and a half equivalents are set free. If the apparatus is then immersed in boiling water, the disengagement of gas is kept up until altogether three equivalents of oxygen are obtained from the permanganic acid. — (*Bull. soc. chem.*, xxxviii. 383.) C. F. M. [15

The double haloid salts of mercury. — For the purpose of obtaining a more definite knowledge of reactions which take place in the formation of double salts, M. Berthelot has determined the heat of formation of certain double salts of mercury. It appears that the quantity of heat liberated in the formation of the anhydrous salt is smaller than when the hydrous salt is formed: $Hg Cl_2 . K Cl = +1^{cal.}9$; $Hg Cl_2 . K Cl . H_2O = +2^{cal.}7$. The acid salt Hg I. 2 H I. sets free the same amount of heat as the salt Hg I. 2 K I. While the heat of formation of the three haloid salts of potassium is nearly the same, it is very different in the corresponding salts of mercury: $Hg Cl_2 = 11^{cal.}$; $Hg Br_2 = 15^{cal.}4$; $Hg I_2 = 21^{cal.}7$. This inequality, as the author proposes to show, is the determining cause of double decompositions. — (*Bull. soc. chim.*, xxxviii. 369.) C. F. M. [16

METALLURGY.

New process of manufacturing aluminum. — A mixture of alum and pitch is calcined, retorted, and leached. The residue contains 84 per cent of alumina, while the old process yielded only 65 per cent. The alumina is then made into the chloride; and the chloride is treated with sodium, in the usual way, to obtain the metal. The process has been invented by Mr. James Webster of Holywood, England. — (*Eng. min. journ.*, Dec. 23, 1882.) R. H. R. [17

Fine gold from chlorination. — Gold produced from the mines of the Canada consolidated gold mining company by Mear's chlorination process is reported to be the finest ever received by the U. S. mint. — (*Eng. min. journ.*, Nov. 18, 1882.) R. H. R. [18

Improvements at Batopilas in silver amalgamation. — The losses of 50 oz. per ton in the tails by the old arrastras have been reduced to 8 oz. per ton. The improvements consist of pan amalgamation for the first and second class ore, concentration followed by pan amalgamation for third-class ore. The loss in mercury has been reduced at the same time from 27 per cent, as incurred by the arrastra, to 2½ per cent with the pan. — (*Eng. min. journ.*, Nov. 18, 1882.) R. H. R. [19

GEOLOGY.

Lithology.

Some Himalayan melaphyrs. — Col. C. A. McMahon has made a microscopic examination of certain traps regarding whose origin some doubt had been expressed. The prevailing tendency had been to hold that they were sedimentary rocks metamorphosed; but McMahon holds that his microscopic researches afford abundant proof that they are altered basaltic lavas. Two plates accompany the paper, which indicate either a very low grade of art or a very small appropriation. — (*Rec. geol. surv. India*, 1882, xv. 155.) M. E. W. [20

Rocks classified by formations. — Prof. E. Renevier has published the following classification,

which he regards as a natural one; and, although many will not be disposed to agree with him, it contains certain elements of value.

Deuterogenous rocks.	Clastogenous rocks.	Gravels.
		Breccias.
		Conglomerates.
	Psammogenous rocks.	Sand.
		Sandstone.
		Quartzite.
	Ilyogenous rocks.	Earthy rocks.
		Schistose rocks.
		Lithoidal rocks.
Organogenous rocks.	Zoögenous rocks.	Phanerozoic limestones.
		Microzoic limestones.
		Clastozoic limestones.
		Crypozoic limestones.
	Microntogenous rocks.	Siliceous microntogenous rocks.
		Ferrugineous microntogenous rocks.
	Phytogenous rocks.	Fossil resins.
		Bitumens.
		Fossil carbons.
		Vegetable earths.
Hydatogenous rocks.	Halogeneous rocks.	Saline rocks.
		Gypseous rocks.
	Crenogenous rocks.	Incrustations.
		Concretions.
		Pisolites.
	Phlebogenous rocks.	Quartz, calcite, siderite, barite, fluorite, phosphorite, etc.
Pyrogenous rocks.	Chysiogenous rocks.	Trachytic lavas.
		Basaltic lavas.
		Euritic lavas.
		Dioritic lavas.
	Athrogenous rocks.	Volcanic breccias.
		Volcanic tuffas.
Crypogenous rocks.	Granitoid rocks.	Granitic rocks.
		Syenitic rocks.
	Crystalline schists.	Aluminio-alkaline schists.
		Magnesian schists.

(*Arch. sc. phys. nat.*, 1882, July 15.) M. E. W. [21

Meteorites.

The Dresden meteorites. — A. Purgold gives a list of the forty-five specimens of meteorites in the Dresden museum, adding a brief description of each specimen. Following Tschermak, the meteorites are arranged according to the following classification: —

I. Meteoric stones.
   1. Anorthite and augite. Iron rarely seen. Eukrite.
   2. Olivine, bronzite, enstatite. Iron rarely seen.
   3. Olivine and bronzite with iron. Chondrite.

II. Meteoric iron.
   4. Silicates and meteoric iron forming a granular mixture. Mesosiderite.
   5. Meteoric iron porphyritically enclosing crystals of silicates. Pallasite.
   6. Meteoric iron.

(*Abhandl. gesellsch. Isis*, 1882.) M. E. W. [22

The Pallas iron. — Dr. Stanislas Meunier has made a recent study of a specimen of the celebrated iron olivine meteorite found by Pallas at Krasnjarsk, Siberia. He regards the structure of this meteorite as a vein-form similar to the terrestrial veins commonly known as *filons en cocardes*. The pyrrhotite in this he seems to regard as derived from the nickeliferous iron by the action of sulphuretted hydrogen. On account of this derivation, he claims that this meteorite should be separated from the others enclosed under the pallasites by Gustav Rose. — (*Comptes rendus*, XCV. 938.) M. E. W. [23

Fusion-structures in meteorites. — In this abstract Mr. F. G. Weichmann holds that the supposed organic forms described by Dr. Otto Hahn from meteorites are 'fusion structures,' that is, formed by the cooling of the meteorite from a state of fusion. This view was taken by Prof. Kengott in 1868, when he described these structures in the Knyahinya meteorite, the one in which Hahn found most of his so-called meteoric corals, crinoids, etc. Judging from the abstract, the completed paper of Weichmann will contain much interesting matter. — (*Trans. N. Y. acad. sc.*, 1882, i. 153.) M. E. W. [24

METEOROLOGY.

The hurricane of Oct. 20, 1882. — The observatory of Manila has published a small monograph containing a detailed account of this disastrous storm. It is rare that a storm of this nature passes so near an observatory equipped with self-recording instruments, as in this instance. The centre of the storm moved almost exactly over Manila, which gives this report peculiar value. It contains a chart of the records of the several meteorological instruments, and diagrams illustrating the progress of the hurricane. The observations recorded as the centre of the depression was passing are especially noteworthy. The pressure experienced a rapid fall of 24 millimetres in 3½ hours, and a correspondingly rapid rise; the temperature rose from 25° to 31° C. in forty-five minutes, and fell with equal rapidity; while the relative humidity dropped from 100 to 53 per cent in the same short time, and rose again. The velocity of the wind, which was 54 metres per second (about 120 miles per hour) immediately before and after the passage of the centre, was 0 for two minutes only before the change of its direction. The diameter of the vortex was about 15 miles, and its velocity of translation 19 miles an hour. — W. U. [25

[An abstract of the Jesuit observations with fuller details and diagrams is given in another part of this week's issue.]

Exposure of thermometers. — Experiments made by Dr. Gill at the Cape of Good Hope, with the Stevenson shelter, Glaisher stand, and a window screen, show large differences in the records of maximum and minimum temperature. An extreme difference of 9.2° is found in the annual value for 1881 of the range between the maximum and minimum readings. Experiments made by Rev. F. W. Stow, with the Stevenson and metallic shelters, favor the latter; but care was not taken to have the shelters of the same size, and the instruments similarly placed within them. There is much need of attention to the subject of uniformity of thermometer exposure, especially in this country. — (*Quart. journ. meteor. soc.*, July, 1882.) W. U. [26

The aurora. — M. Angot considers that the past records of auroral phenomena distinctly indicate diurnal, annual, and secular periods. His researches confirm the electrical theory of the origin of the aurora, as elaborated by Edlund. — (*Lum. électr.*, Dec. 16, 23, 1882.) W. U. [27

PHYSICAL GEOGRAPHY.

Terraces and beaches about Lake Ontario. — J. W. Spencer continues his studies in Canada in the region of the former connection of Lakes Erie and Ontario, and finds evidence of post-glacial lake-submergence 1,700 feet above present sea-level: the Great Lakes must then have been confluent, and connected with the sea by several outlets, — St. Lawrence, Mohawk, southward from Cayuga and Seneca Lakes, and by several paths southward across Ohio. The beaches corresponding to the level of these old outlets are believed to be the most conspicuous and widespread. The 'Artemesia gravel' is regarded as a shore deposit of the subsiding lake. Shore-ice is considered an important agent in building the beaches. — (*Amer. journ. sc.*, Dec., 1882.) W. M. D. [28

High river terraces of eastern Connecticut. — Following the work of Prof. J. D. Dana (*Amer. journ. sc.*, x., 1875, 429), B. F. Koons explains the position of several terraces as depending on ice-dams during the decline of the glacial period. — (*Amer. journ. sc.*, Dec., 1882.) W. M. D. [29

Southward discharge of Lake Winnipeg. — Prof. J. D. Dana decides against Winchell's and Upham's view, that the former southern overflow of Lake Winnipeg was due to a northern ice-barrier; and in favor of Warren's and G. M. Dawson's explanation by a change of level, chiefly a northern depression, because the old lake-shore is no longer level, but slopes to the north with the general slope of the adjoining plateau. — (*Amer. journ. sc.*, Dec., 1882.) W. M. D. [30

Temperature of Wisconsin lakes. — E. M. Gifford and G. W. Peckham found a bottom temperature at 80 ft., of 42° F. through the summer and 39° or lower in the winter. — (*Trans. Wisc. acad.*, v. 273.) W. M. D. [31

GEOGRAPHY.

(*Arctic.*)

Explorations in Alaska. — Drs. Arthur and Aurel Krause of the geographical society of Bremen, who undertook, under the auspices of the society, in 1881, to make explorations in Alaska and the neighborhood of Bering Strait, have returned, and made their preliminary report to the society. In the spring of 1881 they took passage on a small schooner for Bering Strait, and were landed near St. Lawrence Bay on the shores of the Chukchi Peninsula. Here they spent the summer in exploration, returning to San Francisco in autumn, and thence proceeded to Alaska. The winter was spent at a trading-post on Chilkoot Inlet at the head of Lynn Canal, in lat. 59° N., and long. 135° W. Last summer Dr. Aurel Krause returned to Germany, *via* Panama; and in October his brother followed him by way of the line of the Northern Pacific railway. They brought very extensive collections. A catalogue of the ethnologica has just been issued by the society. The natural-history material has been assigned for study by the director of the Bremen museum as follows: crania, to Prof. Welcker; echinoderms, to Prof. H. Ludwig; fish, to Dr. F. Heincke; decapod crustaceans, to Dr. F. Richters; hydroids and polyzoa, to Herr Kirschenpauer, in Hamburg; reptiles, to Dr. J. G. Fischer; Prof. Metzger takes the amphipods and isopods; Poppe, the copepods; Dr. P. C. Hoek of Leiden, the cirripeds and pycnogonida; Dr. Marenzeller, the annelids; Prof. C. Heller, the tunicates; Dr. F. Karsch, the spiders and myriapods; Dr. W. Peters, the mammals; Director Spängel, the amphibians and zephyreans; Dr. Hartlaub, the birds; Drs. Krause and von Martens, the mollusks; Dr. Aurel Krause, the fossils; while the botanical collections are divided among Drs. F. Kurtz, C. Müller of Halle, Gottsche, and Hagena. Charts of part of the west shore of Bering Strait, of the water-shed between the head of Lynn Canal and the sources of the Yukon, of the East Cape of Asia, and various harbors, have already been issued from plans by the explorers, in the Deutsche geographische blätter. On Nov. 4, Dr. Aurel Krause lectured before the Gesellschaft für erdkunde, Berlin, on the T'linkit Indians of Alaska. The preparation of the final reports will naturally take some time; but the society is to be congratulated on its successful foray in a region so difficult of access, and so distant from the base of operations. — (*Deutsche geogr. blatt.*, v. 4, 1882.) W. H. D. [32

Arctic whalefishery in 1882. — The 'catch' of the Dundee whaling-fleet, eight steamers, amounts to seventy-nine whales, affording about nine tons of blubber each, equivalent to about 5,000 bbls. oil and 100,000 lbs. baleen. Last year, a much more 'open' season, only forty-seven whales were obtained. In the Bering-strait region, the San Francisco fleet obtained a fair reward for their exertions in the form of 21,054 bbls. oil, 313,100 lbs. baleen, and 16,600 lbs. walrus-tusks. The fleet numbers about thirty sail, and the value of the 'catch' reported is about $960,000. The species pursued in these seas are Balaena mysticetus L. (*bowhead* of the Pacific whalemen, and *right whale* of the North-Atlantic whalers), and B. Sieboldii Gray (known as the Pacific right whale). The whalers resort to 'walrusing' in Bering Strait in default of whales; but in good seasons little walrus-oil is taken, and most of the tusks are purchased by barter from the natives of the region. — W. H. D. [33

(*Africa.*)

German exploration in Africa. — In the past nine years, the German African association has sent six expeditions to the Kongo region, at a total cost of £22,000. The first, under Güssfeldt (1873–76), went to the Loango coast, north of the Kongo. Although not penetrating far into the interior, this trip alone cost £10,500. All the other expeditions entered at S. Paolo de Loanda. Pogge (1875) advanced 700 miles eastward to Kawenda, the chief town of a region as large as Germany, ruled by the Muata Yanvo (king) named Shanama. Mohr died at Malandje, the most advanced Portuguese trading-station, 200 miles from the coast. Schütt (1877–79) reached the Chikapa River, 500 miles inland. Buchner (1879–80) went also as far as Kawenda, staying there six months; and on returning early in 1881, met at Malandje the latest expedition, still in the field, under Pogge and Wissmann. Finding the road to the Muato Yanvo's town (Kawenda) closed on account of his difficulties with the neighboring and aggressive Kioko, Pogge and Wissmann turned north-east, and were last heard from among the Tushilange people, at the towns Mukenge and Kingenge, on the river Ruru (Lulua). They intended going on past Lake Mukamba to Nyangwe, on the Lualawa (Lualaba), lat. 4¼° S., long. 26½° E., whence Wissmann was to proceed to the east coast if possible, and Pogge would return westward. [Wissman arrived at Zanzibar last November.]

The region consists of three physical divisions: the littoral slope, barren and dry, with short rivers running westward; the mountain belt; and the southern part of the Kongo basin, of undulating or hilly surface, well wooded or grassy, cut by very numerous rivers generally running northward, and nearly all with the syllable Lu, Ru, or Ku in their names. This district has a rainy season from September to April, with a temperature from 63° to 81° F. The dry season is occasionally as cool as 45°. The hippopotamus is the only large animal seen; other large game is very scarce. — (*Proc. geogr. soc. Lond.*, Nov., 1882, map.) W. M. D. [34

Upper Senegal and Niger. — Commandant Galieni was charged by the Governor of Senegal, in 1880, with a mission of exploration in western Soudan, and with powers of treaty to induce the Sultan Ahmadou of Segu to place the Niger within his dominions under French protection. The expedition left St. Louis, Jan. 30, 1880, and began its work of exploration beyond Bafulabe, where the Senegal branches, on March 30 following. Ascending the Ba-khoy branch, the village chiefs accepted French protection; and by Mount Kita a fort was built to serve as an advanced outpost. Here the party divided; Lieut.

Vallière going by Murgula and Kumakhana, and Gallieni crossing eastward to the Ba-ule, to meet again at Bammako on the Niger. Vallière accomplished his journey successfully; but the commandant was attacked at Dio, on May 11, by 1,500 Bambaras, and after a hard fight and heavy loss escaped, leaving his supplies, and joined Vallière as planned. Then crossing to the right bank of the Niger, the whole party descended toward Segu, but were detained at Nango, some leagues from the capital, for ten months, by order of the Sultan. Here they suffered greatly from privation and fever, till at last, concluding a favorable treaty with the Sultan after many *palabras*, they turned back March 21, 1881, returning as Vallière had entered, and reaching St. Louis on May 12. The country was found to be but moderately mountainous: the highest point was by Kumakhana, 750 met., the divide here between the Ba-khoy and Niger being 450 met. The Niger, where followed, was about 300 met. above sea-level. The rainy season lasts from June to December, the rest of the year being dry. Many details are given concerning the best routes for road-construction into the interior. — (*Bull. soc. géogr. Paris*, map.) W. M. D. [35

Expedition to the Kuengo. — This westernmost of the large southern branches of the Kongo has been visited by v. Mechow between lats. 5° and 8° S. He entered and returned by S. Paolo de Loanda. On reaching the river, he descended it to within about 100 miles of its junction with the Kongo, when he was obliged to return by the fear his men felt for supposed cannibals beyond. The river was 1,000 to 1,800 paces broad, enclosed by luxuriant forests in a well-marked valley. Von Mechow returned to Germany early in 1881. — (*Verh. gesellsch. erdk. Berlin*, ix. 1882, 475.) W. M. D. [36

Reported lake west of Albert Nyanza. — Mr. F. Lupton, governor of the Egyptian province Bahr el Ghazal, writes on July 27, 1882, of the reported existence of a great lake, as large as Victoria Nyanza (Ukerewe), about lat. 3° 40′ N., long. 23° E. The Barboa people, living on its eastern shores, are said to make a three-days' voyage across the lake, and obtain from the tribes on the western side beads and wire of European make. Mr. Lupton thinks the Uelle flows into this lake, and that its outlet joins the Kongo. — (*Proc. geogr. soc. Lond.*, Nov., 1882.) W. M. D. [37

BOTANY.

(Structural and physiological.)

Chemical character of living protoplasm. — In 1881 Loew and Bokorny published an interesting paper on the effect produced by very dilute solutions of gold and silver on living cells. The protoplasm soon becomes distinctly colored by reduced gold or silver, whereas dead protoplasm gives no such reaction. The present paper by the author first named adds a few details, and attempts a fuller explanation of the phenomena. A single milligram of a salt of silver or gold is dissolved in a litre of water; and the minute object — for instance, a few threads of a filamentous Alga — is placed in the whole amount of liquid. The reactions described by the authors are not seen when the object is treated with the reagents in a more concentrated form, or in a smaller quantity of liquid. Under conditions wholly favorable to the reaction, the protoplasm becomes tinged with faint color in a short time. When, however, a cell containing protoplasm which has been destroyed by chemical or mechanical means is subjected to the same conditions, no change of color is observable. The reaction is assumed to be due to the presence of one or more members of the aldehyde group in the living protoplasm. The authors call attention in their first paper to the singular fact that certain Algae failed to give this reaction. — (*Bot. zeit.*, Dec. 1, 1882.) G. L. G. [38

Some leaf-movements and light. — To express the greater longitudinal growth upon the upper than the lower side of a part, by which the part bends downward, the term epinasty has been used. Detmer, by experiments on germinating plants, has become convinced that the epinastic movements of leaves are wholly dependent on light; and he proposes a new term, photo-epinasty, in part place of the older one. — (*Bot. zeit.*, Nov. 17, 1882.) G. L. G. [39

Epinasty of leaves results, according to E. Mer, from the more rapid development of the palisade cells of the upper surface under the influence of light. — (*Comptes rendus*, Dec. 11, 1882.) G. L. G. [40

Development of pollen in cycads and conifers. — By Jurányi; in part, a reply to Treub of Buitenzorg (Java). The formation of the pollen in Abies and Pinus is almost precisely that of the cycads. — (*Bot. zeit.*, Nov. 24 and Dec. 1, 1882.) G. L. G. [41

Colors of flowers, and light. — According to Schnetzlar, the blue coloring matter in the corolla of Platycodon grandiflorum can be seen to come from the breaking-up of chlorophyl granules pre-existent in the cells. The blue nectaries develop their color even in unopened flowers, and therefore in partial darkness; but the upper part of the ovary becomes blue only in full light. — (*Arch. sc. phys. nat.*, Nov. 15, 1882.) G. L. G. [42

Colors of flowers. — Dr. Müller, in reviewing the subject of floral colors from a biological standpoint, gives abstracts of the contributions to our knowledge of their uses. Readers who confine themselves chiefly to books and papers published in the English language will find that much of what they have been accustomed to treat as original with some of our favorite writers, on the inter-relations between flowers and insects, is here traced to the earlier contributions of German investigators. — (*Kosmos*, 1882, 117.) W. T. [43

Floral forms. — In his 'Across lots,' Mr. Gibson gives us a little pleasantly written philosophizing suggested by the variety in the forms of flowers. — (*Harper's mag.*, Nov., 1882.) W. T. [44

Season of flowering. — Australian acacias, transplanted across the equator into northern India, have been found to gradually adapt their time of flowering to the changed springtime of their new home. For about twenty years, according to Dr. Brandis, no change was noticed; but since it began they have bloomed earlier each successive year until now, twenty years later, they bloom in June instead of October. — (*Indian forester*, 1882.) W. T. [45

(Systematic.)

American asclepiads. — Fournier begins an enumeration of the Asclepiadaceae of America, excluding for the most part the United States and Brazil, with notes and descriptions of some new genera and species. — (*Ann. sc. nat.*, 1882, 364.) S. W. [46

Indian species of Primula and Androsace. — Professor G. Watt describes and figures twenty-four species of Primula and six of Androsace from the Himalaya, most of them new or previously undescribed. The paper has undergone revision by Sir J. D. Hooker, and includes notes on the geographical distribution of Primula, remarkable inasmuch as the nearly one hundred species are confined to the temperate and cold regions of the northern hemisphere, with the exception of a single species that abounds in Fuegia and the Falkland Islands. — (*Journ. Linn. soc. Lond.*, Dec., 1882.) S. W. [47

Lythraceae. — Continuation of Koehne's monograph, comprising the genera Decodon, of a single North American species (D. verticillatus, Elliott), Grislea, Adenaria, Tetrataxis, and Ginoria, — the first two perhaps to be united to Heimia, and the last including Antherylium. — (*Engler's bot. jahrb.*, Oct., 1882.) S. W. [48

(*Fossil plants.*)

Heer's Flora fossilis arctica. — The second part of the sixth volume of this celebrated work describes plants of two stages of the cretaceous of Greenland, — those of the schists of Come, referable to the lower cretaceous; those of the schists of Atane, upper cretaceous, including a few species from Pattook, a higher member of the formation of Atane. The publication of the tertiary plants of the same country is reserved for the third part of the volume, the plates being already prepared. All these plants have been described from specimens obtained by the Swedish geographical and geological survey of Greenland under the direction of Steenstrup. And such a degree of attention has been given to paleontological researches by the assistants of the survey, that twenty-five large boxes of specimens of fossil plants were sent to Heer.

The flora of Come, composed of 86 species, has 42 species of ferns, 1 Marsilia, 1 Lycopodium, 3 Equisetaceae, 10 Cycadeae, 21 conifers, 5 monocotyledons, 1 dicotyledon only, and 2 Carpolithes. The flora of Atane, composed of 177 species, has 3 fungi (Hypoxyleae), 34 ferns, 1 Marsilia, 1 Selaginella, 1 Equisetum, 6 Cycadeae, 26 conifers, 8 monocotyledons, and 97 dicotyledons. These two groups of floras of the cretaceous are remarkably different in their composition and in their characters. Besides the great proportional disparity in the number of their representatives, in divers classes of the vegetable kingdom, there is as marked a difference in the characters of the species. While Atane has 97 dicotyledons, Come has only 1, a Populus, represented by a few fragments of leaves; and of the whole number of described species, only 7 ferns, 1 Equisetum and 6 conifers are common to both floras of Come and Atane. This last series of plants shows a greater degree of relation to the flora of the Dakota group: for we find in common to them, 2 ferns, 3 conifers, 1 or 2 cycads, and 8 dicotyledons; and also, the same degree of analogy is remarked in the animal fossil remains found in strata above the schists containing vegetable remains at Atane, and of which some species have been recognized by M. Loriol as identical with those of the Fox Hill group of Hayden, like Avicula nebrascensis Evans, Solemeya subplicata Meek and Hayden, Hemiaster Humphriesianus Meek. — L. L. [49

ZOÖLOGY.

(*Geographical distribution.*)

The Sonoran region. — In continuation of an argument upon the desirability of uniting the nearctic and palearctic zoölogical regions, Prof. Heilprin stated his reasons for separating the Sonoran region (the south-western portion of the United States, and the Mexican state of Sonora) from the rest of North America, and uniting it with the neotropical or South-American region. The reptiles and batrachians, especially of the smaller district, were sharply distinguished from those found to the north and east, and allied to the southern forms.

Dr. Horn stated that the coleopterous fauna of the Sonoran region was, on the contrary, more closely allied to that of the rest of North America. — (*Acad. nat. sc. Philad.; meeting* Jan. 2.) [50

Zoölogical geography of western North America. — Prof. E. D. Cope presented for publication a paper entitled: Notes on the geographical distribution of Batrachia and Reptilia in western North America. The communication is based on collections made by the author and his assistants at various points in the Rocky-Mountain and Pacific regions during the last ten years, and is an important contribution to the final definition of the zoölogical provinces and districts of the continent.

The results to zoölogical geography obtained by the identification of species contained in the collections are as follows: The extension northwards of the range of Crotalus molossus, Stenostoma dulce, Diadophis regalis, Crotalus lepidus, and Holbrookia texana; the extension to the Rocky Mountains of the range of Spea Hammondii; the discovery of a new Scaphiopus in the Great-Basin district; and of the southern extension of Rana pretiosa into the same. It has also been determined that the North-Pacific fauna extends east to the Rocky Mountains. This fauna is especially represented by Bascanion vetustum, Rana pretiosa, and Bufo columbiensis. The Great-Basin district of the Sonoran fauna extends north to the southern slope of the Rocky Mountains in Idaho, where are found several of its species. The same fauna extends north along the eastern slope of the Sierra Nevada, to the beginning of Surprise Valley, California. The North-Pacific fauna extends from Surprise Valley, Eastern California, northwards as far as the author's explorations have extended; viz., to Silver Lake and Klamath Lake. A wide southern range for Spea Hammondi and Bufo columbiensis was also determined.

These results indicate that the Pacific region has much greater extension eastward than has been supposed, although foreshadowed in Mr. Cope's paper on the zoölogy of Montana, published in 1879. They also indicate that the region must be divided into three districts; for which the names Idaho, Willamet, and South-Californian are proposed. The first is characterized by the absence of Gerrhonotus, and of certain species of Amblystoma and Cynops. The South-California is characterized by the presence of Rhinochilus, and absence of Amblystoma. It is allied to the Sonoran region, to which it is adjacent. — (*Acad. nat. sc. Philad.; meeting* Jan. 9.) [51

Protozoa.

Perception of light by low organisms. — Th. W. Engelmann has published some interesting observations on this subject. He maintains that light acts in three fundamentally different manners: 1. Directly, by alteration of the exchange of gases, without demonstrable addition of sensation; 2. Alteration of the sensation of the respiratory needs, consequent upon alteration in the gaseous exchange; 3. By means of a specific process assumably corresponding to our sensation of light. By ingenious arguments he seeks to prove that Navicula is a type of the first, Paramecium bursaria of the second, and Euglena viridis of the third. As regards the last he says that the seat of the perception of light is exclusively in the anterior end of the body, where there is no chlorophyl. — (*Pflüger's arch.*, xxix. 387.) C. S. M. [52

Bütschli's Protozoa. — Parts 14–16 of Bütschli's invaluable revision of the Protozoa in Bronn's Klassen und ordnungen des thierreichs has just appeared. The plates (xxii.–xxviii.) refer to the Radiolaria; the text is entirely devoted to the Gregarinidae, which are nearly completed. It is hardly possible to estimate this work too highly; for there are no other animals concerning which so many errors have been current in recent years as the Protozoa, and it cannot fail to advance zoölogy to have them treated by so

able and competent an investigator as Prof. Bütschli. It is one of the few works that may be fairly termed indispensable to the microscopist and zoölogist. (It is stated from a competent private source that probably two years will be needed to complete the undertaking.) C. S. M. [53

Mollusks.

History and distribution of the fresh-water mussels. — Under this title Dr. R. E. C. Stearns prints a suggestive paper, read before the California academy of sciences, Nov. 20, 1882. The geographical distribution, geological history, and principal subdivisions of the Naiades are summarized, and the species of the great basins and the Pacific slope subsequently taken up in more detail. Anodonta Nuttalliana, representing four nominal species, described twenty-five years ago by Dr. Isaac Lea, from the Wahlamet River of Oregon, has been traced over an immense area, including the drainage system of the Columbia, the valley of California, the lakes of the eastern slope of the Sierra Nevada, thence, either recent or recently fossilized, across the desert to the Wahsatch Mountains, northward to the southern boundary of Idaho and Oregon, along the meridian of 110° W., through part of Montana, to British Columbia, and southward to Fort Yuma. They are found on the surface of the desert, and even, with other still recent species, at a depth of at least fifty feet below the surface. Some of the species have been supposed to be extinct; and in regard to Tryonia, announced by Mr. Tryon in 1873 as found in the living state in Utah by Wheeler's expedition (two specimens), further confirmation seems desirable before it can be confidently claimed as still inhabiting the region. The general uniformity of mollusk-fauna over this region at one time is, however, sufficiently evident. Dr. Stearns traces variations perpetuated by natural selection during the changes brought about in the region by important geological and climatic changes; the radiating distribution from higher altitudes to lower, as the land rose and the waters receded; and the missing links in the chain of migration arising from areal desiccation. He ascribes to the period immediately preceding the glaciation of the higher regions of this area, meteorological conditions more favorable to distribution of aquatic life than any since obtaining there. The author then discusses the circumboreal distribution of four or five species of Limnaea, Physa, etc., and of the fresh-water pearl mussel (Margaritana margaritifera L.), which exhibits some remarkable characteristics in its range. The latter is eaten by the McCloud-River Indians, and by some Oregonian tribes. He concludes, with Wetherby, that the earliest fresh-water forms were lacustrine; and the paper closes with references to the comparative antiquity of Unio and Anodonta, and a list from Lea's synopsis of the number of species of Naiades. — W. H. D. [54

Studies of the Italian cretaceous fossils. — Under the auspices of the Accademia dei lincei, Professor G. Seguenza has just published a valuable memoir on the middle cretaceous formation of southern Italy. Already well known by his valuable contributions to our knowledge of the tertiary strata of the two Sicilies, and especially of Calabria, the present publication can only add to his reputation. The first part discusses the sufficiently simple geology of this formation; the second is devoted to the fauna, which is illustrated by sixteen quarto plates beautifully drawn by the author. Of the 223 species described in this work, 104 are supposed to be new, and 186 are mollusks. There are fish remains of two species, twelve echinoderms (of which nine belong to the genus Hemiaster), and only four corals. Only one brachiopod, a Discina, was collected. Of true mollusks twenty are cephalopods, and fifteen gastropods, leaving, as is evident, the majority lamellibranchiate. In fact, the characteristic feature of the fauna is that it is chiefly composed of bivalve shells belonging to the Veneridae, Veniliidae, Crassatellidae, Cardiidae, Arcidae, and the great heteromyarian group of mussels and oysters. The new genus of Corbulidae (?), Coquandia, is described from internal casts (a condition very general among these fossils), and appears to have somewhat resembled Eucharis Recl., but with the cardinal tooth in each valve prodigiously enlarged, flattened, straight, and set at right angles to the margin. — W. H. D. [55

Insects.

North American Coleoptera.—A record of coleopterology for 1881 and 1882 was presented for publication by F. G. Schaupp. The only foreign descriptions of N. A. beetles were an Oedionychis by Harold, a Triarthron by Schaufuss, a Cymatodera by Gorham, six Elateridae by Candèze, and some fifty Dytiscidae by Sharp. — (*Brookl. ent. soc.; meeting* Jan. 6.) [56

Extension of the theory of mimicry in butterflies. — Mimicry of one butterfly by another widely differing from it in structure was explained by Bates as resulting from some special protection of the mimicked form, as, by distastefulness. Recently some cases have occurred in which both genera involved were similarly protected; and Fritz Müller attempted to explain this by showing how it was advantageous for one species to resemble another which is more abundant in individuals, although both may possess qualities distasteful to those creatures which would otherwise devour them. Distant objects to this extension of the theory; and adduces in support Spalding's experiments upon young turkeys bred in confinement, who showed instinctive alarm of sting-bearing insects. Meldola here comes in, and takes up the question of whether birds have an hereditary distaste for nauseous insects, or learn of their nastiness from sad experience. He claims the latter, while Distant replies in favor of the former view. The discussion partakes somewhat of a polemic character, and is rather barren considering our ignorance of the facts in the case: when they disagree as to which is the mimicking and which the mimicked form, philosophizing is somewhat out of place; yet some suggestions worthy of being kept in mind are made by both parties. — (*Ann. mag. nat. hist.*, Dec., 1882, and Jan., 1883.) [57

A carnivorous bee. — P. Parfitt captured on the wing a male Halictus with its mouth full of insects; viz., a fly, a larval homopteron, and several plant-lice. — (*Ent. monthl. mag.*, No. 223.) [58

VERTEBRATES.

Origin of the hypoglossus and morphology of the head. — Perhaps the most interesting and important discovery in embryology made recently is that of the nature of the hypoglossal nerve by Dr. August Froriep. This investigator found, in ruminant embryos, evidences of three distinct proto-vertebrae in front of the first spinal or cervical nerve, and behind the vagus. In front of each of these is a distinct set of anterior nerve roots, which all unite into a single trunk, — the hypoglossus. Over the posterior of these sets of roots is a dorsal ganglion, which also unites with the same nerve, and resembles the spinal ganglia in position and shape, although smaller in

size. The hypoglossus must therefore be considered to have been formed by the fusion of at least three spinal nerves. As is well known, it makes its exit through the occipital bone, which must therefore be regarded as formed by the fusion of several vertebrae. This, again, forces us to the conclusion that the skull is not identically composed in all animals, but that in the mammals portions of the primitive cervical region have been added to the head, the portions thus added being the hypoglossal region.

At present, therefore, we must consider the head as made up, in mammals, of three divisions: 1°, the prepituitary or trabecular region, bearing the nose and eyes, and corresponding to the upper face; 2°, the pseudo-vertebral region, which gives off the nerves, namely, trigeminal, facial, glosso-pharyngeal, and vagus, supplying the visceral arches or pharyngeal clefts. (The vagus, as is well known, is supposed to be the product of the fusion of several nerves.) 3°, the vertebral region, that of the occipital bone and hypoglossal nerve. This is an entirely new start in the interpretation of the morphology of the head.

The ganglion of the hypoglossus is not permanent. It is always smaller than the spinal ganglia, but for a while it enlarges with the growth of the embryo; it then remains stationary, and becomes finally atrophied. Dr. Froriep's clear and concise presentation of his subject, and his philosophic grasp of its far-reaching conclusions, as well as his modest tone, deserve high praise. His short article should be familiar to every morphologist. His observations were made principally on sheep embryos, and by means of longitudinal sections. Embryos of from 8 to about 18 mm. long show the development of the hypoglossus. — (*Arch. anat. physiol., anat. abtheil.* 1882, 279) C. S. M. [59

Origin of the vertebrates. — Mr. C. O. Whitman described a rare form of the blastoderm of the chick, in which the primitive groove extended to the very margin of the blastoderm, terminating here in the marginal notch first observed by Pander. The blastoderm was eighteen hours old, and nearly one centimetre in diameter. The extension of the primitive groove to the marginal notch was regarded as a reappearance of a developmental feature, which is constant in some of the lower vertebrates and their nearest invertebrate allies, but which has ceased to be a normal occurrence in the development of the chick. The blastoderm, interpreted as an atavistic form, was held to be an important confirmation of the theory put forward by His and Rauber, according to which the vertebrate embryo arises by concrescence of the two lateral halves of the germ-ring. The objections made to this theory by Balfour were reviewed, with a view to showing that they presented no serious difficulties to the acceptance of the concrescence theory. Mr. Whitman maintained that Balfour's objections were not broad enough to cover his own theory of the origin of the vertebrates from annelids, — a theory which gave us a right to expect some fundamental agreement in their modes of development. This agreement, he contended, was seen, first, *in the origin of the embryo from a germ-ring, by the coalescence of the two halves along the axial line of the future animal;* and, secondly, *in the metameric division*, which followed in the wake of the concrescence. The theory of the annelid origin of the vertebrates was inconsistent with the denial of the concrescence theory, since concrescence of the germ-bands is a well-established fact for both chaetopods and leeches. The theory of differentiation set up by Balfour in opposition to that of concrescence entirely ignored the annelids, and offered no explanation of the uniform relations of the embryo to the germ-ring. — (*Bost. soc. nat. hist.; meeting* Jan. 3.) [60

Fish.

Use of the saw in Pristis. — In presenting the beak of a saw-fish (Pristis) from the Lake of Bay, Philippine Islands, Dr. S. Kneeland suggested a use for this toothed projection, in this specimen thirty-three inches long, which seems more reasonable than the ones usually given; viz., that it is an instrument for more or less horizontal insertion in the mud or sand of shallow waters, which, by a vigorous sweep of the long upper-lobed, shark-like tail, is quickly pulled out backward. The lateral teeth are sharp-edged in front for easy insertion, but concave behind to offer resistance, and more thoroughly stir up the bottom; this action is doubtless accompanied by a series of short horizontal movements of the anterior part of the body. The mouth is small, underneath, with pavement-like teeth, as in the rays, adapted for crushing the mollusks, crustaceans, and hard-cased creatures on which it feeds. He thinks the stories of its attacking in open sea the smaller cetaceans are errors of observation, arising from confounding the saw-fish with the sword-fish (Xiphias); neither its weapon, its mouth, its teeth, its habitat, nor its habits, can be reconciled with the active carnivorous propensities ordinarily ascribed to it. Ray-like, it is a bottom feeder, with crushing and not tearing teeth: the snout is too blunt for piercing, and its lateral teeth would be an impediment rather than an advantage. — (*Bost. soc. nat. hist.; meeting* Jan. 3.) [61

Digestion in fishes. — Charles Richet finds in cartilaginous fishes of the genera Scyllium and Acanthias, that the gastric secretion is extremely acid and contains pepsin. This pepsin differs from that of the warm-blooded animal in that it acts as well at 20° C. as 40° C., and for its best activity needs a much more acid medium. There is no trypsin in the gastric secretion, though this has been found in other fishes. As regards the pancreas, Richet comes to direct issue with Krukenberg, who states its secretion in these fishes contains trypsin but no amylolytic ferment. — (*Archiv. de physiol.*, x. 1882.) H. N. M. [62

Reptiles.

Fangs of the rattlesnake. — Dr. Leidy exhibited a series of fangs obtained from a rattlesnake fifty-two inches in length. The rapidity with which the functional fangs are reproduced was indicated by the presence, on each side of the jaw, of five fangs in varying degree of development, so placed as to replace those which are lost. — (*Acad. nat. sc. Philad.; meeting* Jan. 2.) [63

Birds.

An hermaphrodite bird. — The subject of this paper by Mr. Jeffries is a green-tailed towhee from Colorado. On dissection the bird was found to possess a normal ovary and duct on the left side, and a normal testicle and vas deferens on the right side. Owing to the early time of capture, and to insufficient means of preservation, the presence or absence of spermatozoa could not be affirmed. The kidneys of the bird showed slight anomalies. The plumage was that of a female. — (*Bull. Nutt. ornith. club*, viii. No. 1.) J. A. J. [64

Peculiar air-sacs. — M. Boulart has found a pair of air-sacs which lie on the sides of the neck, and communicate with the nasal cavity, in Leptoptilus cruminiferus, Ciconia alba, Mycteria australis, and Sula bassana. In these cases there is no communication with the air-sacs supplied by the lungs. In

a species of hornbill, similar sacs are found, but in communication with the lungs, — sacs supposed to be filled by strong expiration, and resultant increase of pressure in nasal cavity. — (*Journ. de l'anat. physiol.*, No. 5, 1882.) J. A. J. [65

Mammals.

Measurement of the quantity of blood in living mammals. — For this purpose Gréhant and Quinquaud employ a method which essentially consists in letting the animal for some time respire a gaseous mixture containing a known and not fatal proportion of carbon-monoxide. At the end of the time the residual gas is analyzed, in order to find the amount of carbon-monoxide which has been absorbed. A specimen of blood is also drawn from the animal, and the quantity of carbon-monoxide in it determined. The ratio of this quantity to the total amount of the gas absorbed is then assumed to be the ratio to the whole blood of the quantity of blood from which the gas was extracted. Their results as to the quantity of blood in the body agree closely with those of previous workers. — (*Journ. de l'anat. physiol.*, 1882, No. 6.) H. N. M. [66

Histology of the pancreas. — In the transactions of the university of Kieff, vols. xi. and xii., for 1881, and vol. i., 1882, W. Podwyssotzki, jun., published an extensive Russian memoir on the structure of the pancreas. The research was carried out in Peremeschko's laboratory at Kieff. The author has just published a German abstract. The secretory cells consist of two zones: a peripheral, with all the characteristics of an albuminoid body, and a central granular zone. In the cavity of the alveoli, the ducts, and the fluid of the gland, the granules are wanting. The granules of the central zone are not pure albuminoids, nor identical with the usual granules of protoplasm; they may be considered the material substratum of the trypsinogen or pancreatic zymogen. The intracellular network (Ebner, Boll) does not exist during life, there being a fluid intercellular substance which may be coagulated like a network by hardening agents. The intercellular spaces are connected with the secretion probably by receiving the transuded fluids from the capillaries. There are peculiar branching, anastomosing, wedge-shaped, connective tissue corpuscles inside the *membrana propria*. The *plate*-shaped processes of the centro-acinary cells extend into the intercellular spaces. Both these and the wedge-shaped cells are metamorphosed connective (not epithelial) cells of the finest ducts. The intercellular fissures, as far as the processes of the centro-acinary cells extend, are the anatomical beginnings of the ducts, which do not therefore arise in special canals or capillaries (Gianuzzi, Savioti). The *membrana propria* is composed of connective fibres, forming a thick and fine network, and contains no cells or nuclei, and sends no processes into the interior of the alveoli. — (*Arch. mikr. anat.*, xxi. 765.) C. S. M. [67

Abnormal dentition in dog and man. — Mr. Jacob Wortman called attention to the presence of a third true molar in the upper jaw of a skull of Canis lupus from Sweden. He considered it a case of partial reversion to a more generalized type, such as Amphicyon, where three molars exist both in the upper and lower jaw, and believed that it furnished a hint as to the probable origin of the genus Canis.

Dr. J. Leidy described a case of abnormal dental development in an adult man. Although the jaws were well formed, they contained only one incisor, one canine, two premolars, and one molar, on each side. Usually when a tooth is absent, and there is no evidence of its having been extracted or lost, it has probably been retained embedded in the jaw; but in the case described no germs of the lacking teeth existed. — (*Acad. nat. sc. Philad.; meeting* Jan. 9.) [68

Anatomy of the Aeluroidea. — St. George Mivart occupies sixty pages with notes on this group, in support of the classification proposed by him in a former memoir. The osteology is dwelt upon at length, and two very extended tables of skeletal proportions are given. — (*Proc. zoöl. soc. Lond.*, 1882, 459.) F. W. T. [69

A monstrous orang. — W. A. Forbes describes an abnormal Pithecia satanas, having the third and fourth digits of both mani webbed to the tips. — (*Proc. zoöl. soc. Lond.*, 1882, 442.) F. W. T. [70

Direct communication between the median vaginal cul-de-sac and uro-genital canal in marsupials after parturition. — J. J. Fletcher found such communication in two nearly adult females of Osphranter robustus, five of Halmaturus ruficollis, and nine of Petrogale penicillatus. In two small specimens of O. robustus and two of P. penicillatus it did not exist. — (*Proc. Linn. soc. N. S. Wales*, vi. 1882, 796.) F. W. T. [71

Mammals of north-eastern New York. — Dr. Merriam enumerates 42 species of mammals for the Adirondack region, including Phoca vitulina, and gives many original notes on the habits of fifteen carnivores. — (*Trans. Linn. soc. New York*, i. 1882, 27.) F. W. T. [72

PHYSIOLOGICAL PSYCHOLOGY.

The time of apperceiving simple and compound concepts. — With the eyes of the observer directed into a dark chamber toward a Geissler tube, the time from the electric illumination of the tube to the instant of closing a key was measured by Dr. M. Friedrich for four observers as the simple reaction time; the additional time required to distinguish colors in this light, to read figures and determine the number of dots irregularly disposed, was then measured. It was found that numbers of two and three figures were apperceived quicker than those of one or four or more, a notable increase of time being required to apperceive the fourth figure. If, however, the first two figures were 18, they were more quickly perceived than any others, being more familiar as designating the present century. — (*Philos. studien*, i. 1.) G. S. H. [73

Psychological methods. — W. Wundt gives the following: 1°. The psycho-physic method, the accuracy of which has lately been questioned, but which Wundt concludes to be valid, save when applied by averaging right and wrong cases, where more thorough tests than Fechner or any of his successors have applied are needed. 2°. The method of analysis of sense-perceptions is made to include (*a*) composition, e.g., Helmholtz's combination of simple tones into timbre; (*b*) decomposition, e.g., Weber's space-threshold; (*c*) variation, e.g., stereoscope, judgment of broken and unbroken lines. 3°. Method of measurement of psychologic time, by reaction, comparison, reproduction, and complication. — (*Philos. studien*, i. 2.) G. S. H. [74

The time-sense. — Two metronomes were allowed by J. Kellert to tick twice, one after the other. The pendulum of one remaining constant, that of the other was then gradually lengthened or shortened till the observer noted a difference in the interval between the ticks of the latter and those of the

former. Seven intervals of the normal metronome from 0.4 to 1.5 seconds were studied. The result showed that the indifference point at which the judgment accorded most accurately with the time of sensation was 0.755 seconds. Intervals less than this were overestimated, those greater than it underestimated. — (*Philos. studien*, ii. 1.) G. S. H. [75

EARLY INSTITUTIONS.

Universities. — On taking the rectorship of the University of Greifswald, Professor Dr. Behrend describes briefly the beginning and growth of universities: the origin of different faculties (medicine, from Salerno; law, from Bologna; theology and philosophy, from Paris); constitutions; relation with the state, and so on. — (*Deutsche rundschau*, Dec., 1882.) D. W. R. [76

English surnames. — Dr. Beddoe, F.R.S., considers them from an ethnological point of view. Large proportion of Norman names among the peers; Saxon names among the small land-owners and yeomen; nothing like a complete amalgamation of blood between the upper and lower classes. Probably a tenth of the inhabitants of the British Isles bear names of the Celtic-Irish type. Several other conclusions are reached. — (*Journ. anthrop. inst.*, xii. 2.) D. W. R. [77

Agrarian institutions. — Professor Hanssen continues his studies of land-holding and agriculture among the early Germans. Certain heads of families joined together in clearing a tract of land. Upon this they took house-lots (permanent holdings) and arable lots (shifted from one part of the clearing to another, according to the field-grass system). The house-lots were held in severalty, the rest of the land in equal, but undivided shares. This was the primitive agricultural community. It is assumed by Professor Hanssen to have been an association of land-owners. We would suggest that it is an open question whether it was an association of land-owners, or an association of tenants. — (*Zeitsch. gesammt. staatsw.*, 1882, 3, 4.) D. W. R. [78

Medieval formulae. — The "Monumenta Germaniae historica. Leges V. Formulae. Pars pria. 4to. 1882," has appeared. — D. W. R. [79

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Smithsonian institution.

Telegraphic announcements of astronomical discoveries. — Arrangements having been completed with the director of the Harvard college observatory for conducting the system of telegraphic announcements of astronomical discoveries, which was established by this institution in 1873, correspondents are informed that hereafter the American centre of reception and distribution of such announcements will be the Harvard college observatory, Cambridge, Mass., to which address all astronomical telegrams should in future be sent. It is hoped and believed that this transfer of a highly important service will prove beneficial to the interests of astronomical science.

National museum.

The museum cases and stands have been recently examined, with a view to adoption, by gentlemen from Richmond college, Cornell university, and the museum of hygiene connected with the United States navy.

Recent additions. — A large collection of remains of the Arctic sea-cow (Rhytina gigas), including eleven skulls more or less perfect, has been recently received from Dr. Leonard Steineger, collector for the Smithsonian institution, at Bering Island. The specimens were accompanied by two skulls of ziphioid whales, and some valuable bird-skins. Nineteen car-loads of specimens have been received from the late Permanent exhibition in Philadelphia.

Cast of a whale. — A cast of a humpback whale has just been completed. It represents a young female, 32 feet 5 inches long, which was captured at Provincetown, Mass., about three years ago. The cast shows one-half the exterior. In the concavity, which is painted black, the skeleton is mounted in its natural position. The work has been done by Mr. Joseph Palmer.

Preparation for the fisheries exhibition. — A large number of objects have been added to the collection illustrating the fisheries, for exhibition in London in April. A model of an undisturbed oyster-bank and of one overdredged are being prepared under the supervision of Lieut. Winslow. One of the museum preparators is in New Haven, engaged in making, under the direction of Mr. Emerton of Yale College, a model of a giant squid. Five relief-models, representing the entire Atlantic coast of the United States, are in course of preparation by the U. S. coast survey, at the expense of the U. S. fish commission. Those representing the Gulf of Maine and the Gulf of Mexico are completed. The latter was exhibited by Professor Hilgard at the recent meeting of the National academy. The isobathic lines are shown in the same manner as the contour lines of the geological relief-maps. The models are prepared by Mr. C. Lindenkohl. Mr. Henry W. Elliott and Capt. J. W. Collins have prepared a series of drawings of fishing-vessels in action. They are probably the most accurate drawings of this nature ever produced, and are worthy of study by artists engaged on marine subjects. The Light-house board and Life-saving service will make a full display of their apparatus.

Model of Zuñi. — An accurate model of the pueblo of Zuñi has recently been completed for the Bureau of ethnology under the superintendence of Mr. Victor Mindeleff. It is about 19 × 11 feet square, and shows the details of the houses and streets. The data for its construction were derived from actual surveys.

Archeological fraud. — A remarkable archeological fraud in the form of a stone idol arrived at the museum a few days ago. It had been advertised as probably the 'god of all the gods.' It has the beak of a bird, the forehead of a lizard, the wings of a beetle, and the abdomen of a grasshopper. The feet are six in number, — four like those of a gopher tortoise, two like those of a seal. The general color is brown, relieved here and there with lighter spots and streaks. The length of the object is about 2½ feet, the width about 6 inches.

Department of agriculture.

Extension of statistical division. — The scope of the statistical division was last year enlarged to include in its monthly reports statements showing the through rates of transportation by railroad and steamboat companies, on all the principal routes of the country, for the principal agricultural products.