than for the student in any other field. It is this sense of the oneness of human history, this sympathy and understanding of men of all times, that gives the charm to his immortal Principles of geology; and in this day, when we are debating as to the use of classical training, it is well to ask what this book would have been if the Oxford element had not been there. It would perhaps have an equally valuable body of fact, but the informing spirit would have been wanting.

His power to make avail of his Oxford life was doubtless due to his keenness of appreciation of all forms of intellectual stimulus, though he took a fair rank in his college, winning second honors in classics. We see in his letters home that he has a lively interest in music, which had been an early-developed taste; for in his schoolboy days he had been the leader of a schoolboy orchestra. He is also something of a versifier; and some of his verses show a delicate fancy, though by no means a strong wing.

His first acquaintance with geology seems to have been made through Bakewell's Geology, which he found in his father's library; and that author's account of the earth's antiquity appears to have first aroused his curiosity to know more of the subject. While he was at Oxford, Buckland was at the height of his singular popularity. His lectures affirmed this early-acquired taste. His first geological journey was to Yarmouth, where he saw the great cutting power of the sea on that soft-cliffed coast. In the same year a journey to Staffa, of which his journal is given, served to possess him of the love for field-work. In 1818, when he was just of age, he made a tour through France, Switzerland, and Italy as far as Rome. His journal showed the keenest appreciation of the ordinary nature of travel, but as yet but little interpreting power. He appears, as were all others of his time, strangely blind to the structure of the Alps: even the parallel moraines on the glaciers puzzle him, — a matter that is one of the most transparent things in their history. The motion of the glaciers is not seen to be a problem: yet his critical spirit is awake; for, one of his party finding in an album the lines, —

> "Mont Blanc is the monarch of mountains:
> They crowned him long ago,
> Enthroned in ice, with robes of clouds,
> And diadem of snow," —

he well says, "It contains more real poetry than I thought could be found in all the albums of Europe." He did not recognize that they, a little garbled, were from Byron's Manfred, which had been published the year before. It may be that it shows us the place of birth of these the finest lines in that strange dramatic poem. Despite the veil that hid the deeper secrets of the Alps from his eyes, his good fortune showed him many things which served to lead his mind to the notion that the present forces of the earth are strong enough to explain the past. He saw the Goldau *éboulement*, or landslide, then but a dozen years old; and in the Rhone valley he beheld the frightful marks of the flood which poured from the lake formed by the Glacier de Bagne but six weeks before his coming.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

GEODESY.

Length of a nautical mile. — In common parlance, the length of a nautical mile is considered as a 'minute of latitude,' without any consideration of the range of value included within this definition. A paper upon this subject by Prof. J. E. Hilgard, superintendent of the Coast and geodetic survey, has just been published. It gives the values of one minute under nine different definitions. The values are based upon the elements of the Clarke spheroid. One minute of latitude at the poles = 1,861.655 metres = 6,107.85 feet; one minute of latitude at the equator = 1,842.787 metres = 6,045.95 feet; one minute on the equator (considering it as a circle) = 1,855.345 metres = 6,087.15 feet.

As adopted by the Coast and geodetic survey and by the Hydrographic office, a nautical mile is *one-sixtieth part of the length of a degree on the great circle of a sphere whose surface is equal to the surface of the earth.* Using the Clarke spheroid, this definition gives a nautical mile = 1,853.248 metres = 6,080.27 feet. This value closely corresponds with the English admiralty knot of 6,080 feet. — (*Rep. U.S. coast surv.*, 1881, app. 12.) H. W. B. [172

Night signals for geodetic work (by Mr. O. S. Wilson of the N.Y. state survey). — Owing to the small number of days during any season when the air is in good condition for sighting points more than twenty-five miles distant, and the few hours during even good-seeing days available for such geodetic work, especially in measuring horizontal angles, it is important not only to use to the best advantage what daylight is available, but also if possible to lengthen every good-seeing day. Hence any device for continuing work during clear nights is of great value. For this purpose electric lights were used on the triangulation carried across the Mediterranean in 1879 by the French and Spanish governments, with remarkably good results; the error of closure of a triangle being but a trifle over one second of arc. Some of these lines were the longest ever sighted for geodetic purposes, one of them being 167.7 miles. The burning

of magnesium-wire, fed by clock-work, in the focus of a parabolic reflector, gives an excellent light; but this, like the electric light, is too expensive for ordinary geodetic uses. The U.S. coast and geodetic survey has used kerosene student-lamps in place of the magnesium wire in connection with parabolic reflectors, on lines of twenty-five miles, with satisfactory results. At a station in Virginia, occupied by C. O. Boutelle, angles measured by day were duplicated at night, and the mean error of the night-work was only two-thirds of that done in the daytime.

In 1881 Mr. Wilson procured a small locomotive head-light with a twelve-inch reflector, and two cast semaphore lenses, one twelve and the other fourteen inches in diameter. Each of these lenses was mounted in the end of a box in which a kerosene-lamp with a 'mammoth-leader' burner was placed at the focus of the lens. These three lights, being set near each other, were readily seen through a small telescope at a distance of thirty-five miles, and little if any difference of brilliancy was detected. The magnesium apparatus and the locomotive head-light each cost about thirty-five dollars; but the magnesium wire being expensive, and this light requiring constant attention, the cost of maintaining it is several times greater than that of operating the locomotive head-light. The cost of a semaphore lens mounted in a galvanized-iron box is from ten to fifteen dollars, according to the size. The expense of maintaining it is small, — not more than fifty cents a night, kerosene being cheap, and no attention being required after the lamp has been properly trimmed, and lighted a short time. These lamps have been seen by the naked eye at a distance of forty miles.

In order to diminish as little as possible the light in the field of the telescope, a series of mirrors was so arranged upon and within the tube as to illuminate the wires, and leave the field dark. It is believed that this has not before been done with small telescopes, the one used in this instance having an aperture of only two and a half inches. Kerosene hand-lamps, protected for use in the wind, were devised and successfully used for reading the circle and illuminating the wires. The night observations thus made at state survey stations in 1882 were apparently fully equal to those taken in the daytime by means of heliotrope signals; and about half of the primary observations were actually made in the time thus saved.

For readily finding a distant signal light at night, a reference lantern was placed a short distance from the observing-station. By this, rough settings were made for the signal-light needed, which could then be brought into view by a slight vertical movement of the telescope. — (*Alb. inst.; meeting* Jan. 30.) [173

MATHEMATICS.

Conjugate quadrangles. — M. Stephanos, in seeking to generalize a kinematical proposition announced by M. Tchekychef in his memoir *Sur les plus simples systèmes articulés qui fournissent un mouvement rectiligne approximatif au quatrième et au cinquième ordre* (St. Petersburgh, 1881), has arrived at a number of properties of conjugate quadrangles. M. Stephanos defines conjugate quadrangles as being formed by two systems of four points (A_1, A_2, A_3, A_4), (B_1, B_2, B_3, B_4), when, being placed upon a plane in any manner, without altering their respective dimensions, the corresponding points (A_i and B_i) form four pairs of conjugate points with respect to a circle. There is an infinite number of quadrangles B, conjugate to a given quadrangle A; and all of the B-quadrangles are similar one to another. If A and B are two conjugate quadrangles, the areas of the triangles A_2, A_3, A_4, etc., are proportional to the areas of the triangles B_2, B_3, B_4, etc. The respective ratios are denoted by $\lambda_1 : \lambda_2 : \lambda_3 : \lambda_4$ with $\Sigma \lambda_i = 0$. λ_1, λ_2, and λ_3 are given in terms of the cotangents of the angles of the triangles A_2, A_3, A_4, and B_2, B_3, B_4. Considering two conjugate quadrangles A and B situated in the same plane, and denoting by ρ_1, ρ_2, ρ_3, ρ_4, the distances between corresponding summits, it is shown, that, whatever be the relative positions of the two quadrangles in the same plane, we have always the relation:—

$$\lambda_1 \rho_1^2 + \lambda_2 \rho_2^2 + \lambda_3 \rho_3^2 + \lambda_4 \rho_4^2 = C;$$

where C is a constant depending only on the dimensions of the two quadrangles. — (*Comptes rendus*, Oct. 16, 1882.) T. C. [174

Conical umbilics. — The following is taken from a report by MM. Bouquet and Jordan upon a memoir presented by M. de Salvert to the Academy of sciences. M. de Salvert studies the sections of a surface $F(x, y, z) = 0$, in those singular points where the tangent cone is of the second degree by planes passing through the axis of the tangent cone. Each section consists of two branches crossing at the multiple point, and having for tangents in this point the two opposite generatrices of the cone: it is proposed to find the curvature of these two branches. The author finds a formula for this curvature, of which he shows the analogy to the known expression for the determination of the radii of curvature of a normal section at an ordinary point. An application is made to the case of the wave surface, and then the author seeks the necessary conditions that the assumed point shall be a conical umbilic: i.e., a point such, 1°, that the tangent cone shall be one of revolution; 2°, that the branches of the curve which correspond to its different generatrices shall all have the same curvature. The first of these conditions leads only to known results; the second introduces six new equations involving the third derivatives of F. — (*Comptes rendus*, Jan. 8, 1883.) T. C. [175

Subdeterminants of a symmetric system. — In July, 1882, Prof. Kronecker presented to the Berlin academy a memoir in which he established certain linear relations between the subdeterminants (minors) of a symmetric system. M. Runge deals with the same subject in the present paper, and claims to show that relations found by Kronecker are the only ones existing, inasmuch as all others can be expressed by linear combinations of Kronecker's relations. He also finds a method for the determination of a system of linearly independent subdeterminants in terms of which all the remaining subdeterminants of the same order are linearly expressible. — (*Journ. reine angew. math.*, xciii. 1882.) T. C. [176

Ternary quartics. — In continuation of his researches on the ternary quartic $x_1^3, x_2 + x_2^3 x_3 + x_3^3 x_1$, and on systems of conics, Prof. Gordan discusses the typical representation of the system formed by this quartic and a conic. He finds that the coefficients in this representation are entire functions of only twelve simultaneous invariants, five of which are expressible as rational functions of the other seven, which are themselves connected by an algebraic equation of the sixth degree; and all these relations are explicitly given. These relations reduce the number of independent invariants to six, which is evidently the actual number. The last part of the article is devoted to the solution of the converse problem of determining a conic when the invariants above mentioned are given. — (*Math. ann.*, xxiv. 1882.) F. F. [177

Equations of the seventh degree. — In this paper, Prof. Gordan applies the results obtained by him

in the paper noticed above to the solution of those equations of the seventh degree in which a certain function of the roots is unaltered by a group of 168 substitutions. Such equations arise in connection with the modular equations of elliptic functions, and had been previously studied by Hermite, Klein, and others. Klein had pointed out that their treatment should be made to depend upon the investigation of the system formed by a certain ternary quartic, which is transformed into itself by a group of 168 substitutions and an arbitrary conic. It was this which led Gordan to undertake his researches upon that system. In the present paper he forms certain seven-valued functions of the coefficients of the arbitrary conic; the sums of the powers of these functions are, in virtue of a general theorem previously proved, rationally expressible in terms of the fundamental invariants of the system; and the fundamental invariants are rationally expressible in terms of the sums of the powers. The seven quantities, then, being regarded as the roots of a given equation, the invariants in question become known, and the solution of the equation is reduced to the problem of finding the coefficients of the arbitrary conic when the invariants are given; the solution of which problem is contained in the preceding paper (No. 177). The whole investigation is extremely long and difficult; and Prof. Gordan announces his intention of recasting the method by which he obtained his results, and giving a presentation of them 'in which every trace of the way in which they were reached shall have disappeared.' — (*Math. ann.*, XX. 4, 1882.) F. F. [178

PHYSICS.

Acoustics.

Sounds produced by flow of liquids. — Tito Martini has continued the researches of Savart upon the sound produced by a stream flowing through a circular hole at the lower end of a long tube containing liquid. He finds that the pitch does not change gradually, but that a definite number of distinct notes are heard successively as the liquid column shortens by the outflow. The pitch depends on the length of the liquid column and on the velocity of efflux. The number of vibrations is proportional to the velocity of efflux, and the sound is pure only when the sound of the vein is one of the proper sounds of the liquid column.

A column of constant length gives notes in a harmonic series. When the sound is re-enforced by the column of air above, it becomes quite loud. If the walls of the tube are prevented from vibrating, the sound ceases. The relative velocity of sound in different liquids may be determined by finding the lengths of the columns of liquid which give the same note, and the results given in the paper agree very well with determinations by other methods. — (*Journal physique*, Nov., 1882.) C. R. C. [179

Vibrations of loaded bar. — MM. Sébert and Hugoniot have investigated by a new method the equations of motion of elastic bars, and especially the case of a bar carrying an additional mass at one end. — (*Comptes rendus*, Oct. 30, 1882.) C. R. C. [180

Determination of rate of tuning-forks. — Michelson has devised a new stroboscopic method, in which a fork — for example, an ut_2 (No. 1) — is compared with a second ut_2 (No. 2), kept in vibration by electro-magnets, and which last fork is compared directly with the seconds pendulum. The whole number of vibrations of fork No. 2 is supposed to be known. The fractions are found as follows: one prong of the fork carries a mirror; and a few feet in front of this is placed a Geissler tube, illuminated once a second, as the circuit of the induction coil in connection with it is broken by the pendulum. The image of the tube itself in the mirror is a broad band, against which the narrow flash is projected. The number of flashes between their recurrence in two similar positions on the broad image of the tube shows the number of vibrations per second to be added to or subtracted from the known whole number. Thus, if there are a flashes in one period, $128 \pm \frac{1}{a}$ is the true rate. As fork No. 2 vibrates continuously, great accuracy can be secured. A mercury globule was used in connection with the pendulum to complete the circuit; and, by means of a relay, a break was produced in the primary circuit of the induction coil. A very constant battery must be used with the electro-magnets of the fork. The method may be simplified by dispensing with the electric fork, and placing the fork to be rated vertically, and with one edge in the focus of a microscope with cross-hairs. The Geissler tube is placed horizontally behind the fork; and the positions of the edge of the fork with reference to the cross-hairs are noted. A table of measurements is given. — (*Amer. journ. sc.*, Jan., 1883.) C. R. C. [181

Experiments with resonance boxes. — At a recent meeting of the Berlin physical society, Prof. Christiani showed a mi_3 fork, which placed on its box gave a maximum of tone when one side rather than the other was turned to the mouth of the box. The action seemed to be due to the box rather than to the fork, though this had been rusted and retuned. It was also found that a singing flame tuned to mi_3 was silenced when a mi_3 resonating box was placed horizontally with its mouth at the top of the tube, while if the corresponding fork was placed on the box no such effect occurred. The same action was noticed with a resonator; the flame being silenced if this was in tune with the flame, but not otherwise. — (*Nature*, Jan. 4, 1883.) C. R. C. [182

Optics.

Density of luminiferous ether. — Note on Glau's determination of the density of the ether, by E. Wiedmann. If an error in this estimate be corrected, the result is measurably in agreement with that of Sir W. Thomson. — (*Wied. ann.*, 1882, 986.) C. S. H. [183

Whiteness of various sources of light. — The results of a series of observations with an instrument devised by Helmholtz, and by him named 'lenkoscope,' is given by A. König. The general principle upon which the instrument depends is the following: A white surface is illuminated by the light to be tested; and two adjacent images of this surface, polarized at right angles to each other, are observed through a Nicol's prism and a certain thickness of quartz cut perpendicular to the axis. With such an arrangement, the two surfaces would appear of complementary colors, the tints being determined by the azimuth of the Nicol, and the degree of saturation by the thinness of the quartz plate. With a thin plate the two portions of the field would always be very unlike; with a very thick plate, always nearly white and alike; and, finally, with a plate of intermediate thickness, the similarity would depend upon the azimuth of the Nicol. The value of the azimuth which yields the greatest similarity when a plate 20 mm. thick was employed — and this angle must evidently depend upon the color of the light used — was taken as an arbitrary measure of the whiteness of the light. The table characterizing various fa-

miliar sources of light is of interest. The angle β is the azimuth of the Nicol's prism.

SOURCE.	β
Petroleum flame	71.1°
Illuminating gas (argand = ordinary burner)	71.5
Lime light	76.7
Incandescent electric lamp (near maximum of brightness)	77.8
Arc light	about 79.0
Magnesium light	86.3
Sunlight	90.5

(*Wied. ann.*, 1882, 990.) C. S. H. [184

Diffraction in telescopes. — A paper on the effect of diffraction on the appearance of a bright disk of indefinitely great radius as seen in a telescope, by H. Struve. — (*Wied. ann.*, 1882, 1008.) C. S. H. [185

Polarization of diffracted light. — The investigation here described relates to the modification which plane polarized light undergoes in diffraction by a reflecting grating of glass, of collodion, or of speculum metal. It is thus closely allied to Fröhlich's research, though of a more general character. The author, W. König, found that within the range of deviation, where elliptical polarization was marked, the determinations of azimuth were not very satisfactory: hence attention was given chiefly to difference of phase in the two components. This difference was measured by a Babinet compensator. All of the results were in satisfactory accordance with Réthy's theory of spherical polarized wave-surfaces, by which he explained the phenomena observed by Fröhlich. The experiments go far to reconcile the contradictory results, obtained by experimenters, who, following Stokes, have attempted thus to determine the relation of the plane of polarization to that of vibration; but at the same time Réthy's theory seems to end all hope of deciding this interesting point by the most promising means hitherto suggested. — (*Wied. ann.*, 1882, 1016.) C. S. H. [186

Elliptic double refraction. — E. Lommel develops his theory of refraction, to apply to the case of propagation of light-waves in a medium which rotates the plane of polarization. The equations yield a form of Biot's law for rotation involving the index of refraction, which corresponds well with observation. — (*Carl's repert.*, xviii. 673.) C. S. H. [187

Galileo's telescope. — An extended discussion of the theory of this form of telescope, by W. Pscheidl. — (*Carl's repert.*, xviii. 686.) C. S. H. [188

(*Photography.*)

Photography as applied to animal locomotion. — A simple method of studying photographically the movements of animals is described by M. G. Demeny. In front of the camera is placed a rapidly revolving disk, containing a narrow sectorial window. A white animal is selected, which moves in the sun before a very black background, best an opening in a darkened shed. The exposures with sensitive plates may be reduced to the $\frac{1}{1000}$ part of a second, the intervening intervals being sufficiently long so that the images shall not be superposed. By knowing the rate of the disk, the speed of the animal may be measured from the negative. If the plate is caused to move in the opposite direction to the image of the animal, the exposures may be made more frequently without fear of superposition, as has been done by M. Marey in his 'photographic sun' (*La Nature*, April 22, 1882). By having a number of windows in the disk, the course of small, rapidly moving objects may be studied: for example, the trajectory of a white stone thrown from the hand, or a white paper attached to the circumference of a carriage-wheel. — (*Journ. de phys.*, Nov., 1882.) W. H. P. [189

Heat.

Production of low temperatures. — After comparing the various methods for producing low temperatures, Mr. Rawbotham concludes that the method by the evaporation of ammonia is the best; ammonia being preferable to other liquids, chiefly on account of its high latent heat, and high pressure at low temperatures. — (*Journ. Frankl. inst.*, lxxxv. 2.) C. B. P. [190

Heat of solution and of dilution of perchloric acid. — In his researches on the oxyacids of chlorine, M. Berthelot has been conducted to the study of the heat of formation of perchloric acid. The solution of the liquid monohydrated acid in one hundred times its weight of water at 19° sets free +20.3 cal. This enormous heat, which exceeds that of all the common monohydrated acids, explains the extreme difference which exists between the action of this acid in solution, and the action of the monohydrated acid. It is found that the molecular specific heats of solutions of perchloric acid, between 40° and 15°, can be represented by the formula, —

$$c = 18n - 2.3 + \frac{273.8}{n} - \frac{742.2}{n^2};$$

n being greater than 6.

The heats of dilution of the acid when in different degrees of solution can be represented by a peculiar hyperbolic curve, similar to that already found for nitric acid. — (*Ann. chim. phys.*, Oct., 1882.) C. B. P. [191

Specific heat. — A modified form of Regnault's apparatus has been employed by M. W. Longuinine for the determination of specific heats. By the revolution of the cylinder the body is dropped through the floor of the chamber, in which it is heated, through a space of 0.08m. into the calorimeter. In order to obtain accurate results, it is necessary for the substance to have a spherical form. When powders and similar substances are used, they are placed in a sphere of brass, the specific heat and weight of which are known. This apparatus appears to give more uniform results than Regnault's.—(*Ann. chim. phys.*, Nov., 1882.) C. B. P. [192

Change of chemical constitution by heat. — Herr E. Wiedman has shown that a number of salts containing water undergo chemical change when heated, though the temperature is below that of fusion. He has thus found two new modifications of the sulphates of zinc and magnesium. The result has interesting bearings in the determinations of tension, and of the heat of solution. — (*Wied. ann.*, No. 12.) C. B. P. [193

Electricity.

A determination of the ohm in absolute measure. — Notice was given by A. L. Kimball of the proposed redetermination of the ohm; the method to be used being the same as that used by Prof. Rowland in 1876, changes being made in the character and arrangement of the apparatus so as to avoid, so far as possible, the repetition of constant errors. A short account was given of the nature and importance of absolute measurement in general, in which the derived units are all based on the fundamental units of length, time, and mass, and derived directly from them. The nature of the unit of electrical resistance was then noticed, and attention called to the fact, that, in the electro-magnetic system of units, the unit of resistance bears to the units of length and time the relation of a velocity. Mention was made of the most noteworthy methods that have been used in determining the value of resistance in absolute measure, attention being called to the manner in which

the units of length and time entered into the experiments. — (*Johns Hopk. univ. sc. assoc.; meeting* Jan. 3.) [194

ENGINEERING.

Automatic inspection of railways. — The precise methods of modern physical research are fast invading the various fields of practical science, and enabling us to be more and more independent of guesswork every year. Nothing illustrates this more forcibly than Mr. P. H. Dudley's dynamometer car, which is drawn from one end to the other of any railway, and, as it goes, records automatically every imperfection existing in the track, and at the end of the trip presents a long roll of paper which is a complete telltale in regard to the exact state of the road. Every bad joint, every defective rail, every lack of correct alignment, either vertical or horizontal, is shown upon the diagram in such a manner as not only to indicate the precise location of the defect, but at the same time to suggest the remedy. The dynamometer car has been employed upon a great many of our more important railroads, with the most satisfactory results. — G. L. V. [195

Railway management as a science. — Art first, and science afterwards, has been the rule in all technological pursuits, to which railways are no exception. We are fast accumulating sufficient data to show that there is such a thing as a science of railway operation; and just as soon as this fact is recognized, this science will find a place in our technical schools. The *Archiv für eisenbahnwesen*, a periodical issued by the Prussian ministry of public works, announces that there will be in the winter semester of the universities of Berlin and Breslau, courses of lectures on railroad operation, including station and train service, signalling, organization and duties of employees, and railway mechanism; and also lectures on railway administration, including the arrangement of rates and fares, the discussion of wages, and railway statistics. A third course will be on railway law, and a fourth on railway transportation as a branch of political economy. — G. L. V. [196

CHEMISTRY.

(General, physical, and inorganic.)

Magnesium carbonate. — H. Beckurts has obtained the normal magnesium carbonate $Mg\,C\,O_3 . 3\,H_2O$ by heating a solution of the bicarbonate to 70°. From a boiling solution the precipitate thrown down had the same composition ($5\,Mg\,C\,O_3 . 2\,Mg\,(OH)_2, 7\,H_2O$) as magnesia alba prepared according to Pattinson's method. — (*Chem. tech. repert.*, xx. ii. 2, 149.) C. F. M. [197

Investigations on chlorine and bromine. — Determinations of the vapor density of chlorine and bromine when mixed with air, by C. Langer and V. Meyer, gave values corresponding to Cl_2 and Br_2. It is proposed to determine whether at high temperatures these substances, like iodine, will give a vapor density corresponding to the half molecule. — (*Berichte deutsch. chem. gesellsch.*, xv. 2769.) C. F. M. [198

Congelation of solvents. — In experiments upon the point of congelation of water, formic acid, acetic acid, benzol, nitro-benzol, and ethylen dibromide, M. Raoult tried the action of each solvent upon two hundred other substances. A solution of one grm. substance in 100 grms. of the solvent gave results from which the following law was deduced: A molecule of any substance whatever, when dissolved in 100 molecules of any liquid of a different nature, lowers the point of congelation of the liquid 0°.62, — a value nearly constant for different solvents. — (*Comptes rendus*, xcv. 1030.) C. F. M. [199

Formation of active oxygen. — Results obtained by Moritz Traube show that ozone is not produced by hydrogen in *statu nascendi*. The hypothesis of Hoppe-Seyler, that chemical processes which take place within the bodies of animals are identical with those resulting from putrefaction, and depend upon the presence of ozone produced by nascent hydrogen, must therefore be incorrect. In support of this hypothesis, Hoppe-Seyler asserted that nascent hydrogen from palladium-hydrogen would convert oxygen into its active condition. The author finds that hydrogen is not evolved from the alloy at ordinary temperatures, and that instead of ozone, in presence of water, hydrogen peroxide is formed. Other results seem to indicate that hydrogen peroxide is a product of reduction rather than of oxidation. — (*Berichte deutsch. chem. gesellsch.*, xv. 2421.) C. F. M. [200

Influence of pressure on the speed of chemical action. — Prof. R. B. Warder made the following remarks: "Menschutkin[1] has recently published his experiments on the decomposition of tertiary amyl-acetate by heating in sealed tubes. At 155° C., while the pressure was gradually increased by the formation of amylene, the speed of the reaction was found to increase until about half the ether was decomposed. Menschutkin's graphical representation of the progress of the reaction has a point of inflection at this stage. This fully accords with the theory of 'action of mass' if we assume that this reaction, like many others, is promoted by pressure.

If the speed of the reaction is directly proportional to the pressure, and if the increase in pressure is proportional to the amylene generated, the course of the reaction should be represented by the equation,

$$\log \frac{u_0}{m - u_0} - \log \frac{u}{m - u} = At.$$

Where u is the quantity of ether still present at any moment, to be eventually decomposed within the limit of the reaction, u_0 is the initial value of u; t is the time of action; $\frac{m - u_0}{m}$ is the ratio of initial to final pressure; and A is a constant, dependent upon the actual pressure, as well as the absolute coefficient of speed.

By making $m = 1.01u_0$, and $A = 0.04$, we obtain an equation which pretty closely agrees with Menschutkin's curve. — (*Ohio mech. inst.; sect. chem. phys.; meeting* Jan. 18.) [201

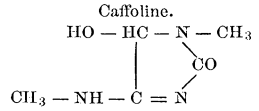
(Organic.)

Caffeine, theobromine, xanthine, and guanine. — In an extended investigation upon the constitution of these substances, Emil Fischer examined many of their derivatives and decomposition-products. Oxidation of caffeine with hydrochloric acid and potassium chlorate gave methylurea and amalic acid. This acid, without doubt, was formed directly from dimethylalloxan, in a manner analogous to the formation of alloxantine by heating alloxan with hydrochloric acid. By oxidation with nitric acid, amalic acid was converted into dimethylalloxantine, which formed cholestrophan by further oxidation. In the oxidation of theobromine, the resulting methylalloxan was immediately changed into the corresponding alloxantine, which gave methylparabanic acid by oxidation. Methylurea also was identified as a product of the oxidation of theobromine. As the decomposition-products of xanthine, alloxan was

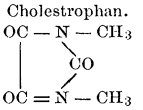
[1] Ber. chem. gesellsch. xv., 2512–2518.

recognized by conversion into alloxantine, and urea was found in the mother liquors. From bromcaffeine the amido-, ethoxy-, and hydroxy-derivatives were prepared; and from the bromine addition-product of hydroxycaffeine, diethoxyhydroxy- and dimethoxy-hydroxycaffeine. When treated with hydrochloric acid, diethoxyhydroxycaffeine was converted into apocaffein, which formed caffuric acid, $C_6H_9N_3O_7$, by boiling with water. By treatment with cold hydriodic acid, caffuric acid gave hydrocaffuric, from which, by decomposition with barium hydrate, methylhydantoin, methylurea, and carbonic dioxide were obtained. The formation of methyhyldantoin is regarded by the author of great importance in explaining the constitution of caffeine. This substance must contain beside the methylurea residue the carbon-nitrogen group of methylhydantoin. In the preparation of apocaffeine, the formation of another substance, hypocaffeine, was observed, which gave caffoline, $C_5H_9N_3O_2$ when warmed with basic acetate of lead. Caffoline gave methylurea by reduction and by oxidation with potassium ferrocyanide, potassium permanganate, and chromic acid, respectively methyloxamic acid, dimethyloxamid, and cholestrophan. The structure of caffoline, based upon the method of its formation and its decomposition-products, would be analogous to that of cholestrophan, —

Caffoline.

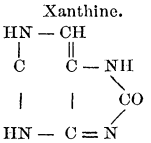


Cholestrophan.

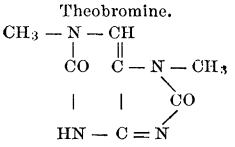


By heating xanthine-silver with methyl iodide, a methyl group was introduced with the formation of theobromine; which is, therefore, dimethylxanthine, caffeine being the trimethyl-derivative. The intimate relation existing between the plant bases caffeine and theobromine, and xanthine and guanine, which occur in animal excretions, would seem to indicate that these bodies are formed in organisms by the same chemical process. The following structure-formulae were proposed: —

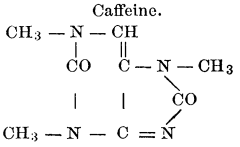
Xanthine.



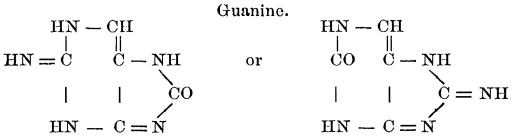
Theobromine.



Caffeine.



Guanine.



(*Ann. der. chem.*, 215, 253.) C. F. M. [202

Synthesis of uric acid. — By heating a mixture of one part glycocol with ten parts urea at 200–230°, Horbaczewski obtained a substance which proved to be identical in its composition and reactions with uric acid. — (*Berichte deutsch. chem. gesellsch.*, 15, 2678.) C. F. M. [203

Action of fomric acid on aromatic amines. — Results obtained by G. Tobias show that formic-acid derivatives of aniline, *o*- and *p*- toluidine, *α*- and *β*-naphtaline, can be obtained with greater ease than the corresponding acet-compounds. Sodium compounds of formortho- and formparatoluidine were examined. — (*Berichte deutsch. chem. gesellsch.*, 15, 2443.) C. F. M. [204

Second anhydride of mannite. — When mannite was submitted to dry distillation *in vacuo*, M. Fauconnier observed the formation of a sirupy body having the composition $C_6H_{10}O_7$. A study of its reactions showed that it contained no carbon atoms united by more than one bond; but whether the two remaining hydroxyl groups were primary, secondary, or tertiary, remained to be determined. — (*Comptes rendus*, 95, 991.) C. F. M. [205

Some derivatives of morphine. — That morphine contains at least one phenyl-hydroxyl group, was shown by M. Grimaux, who converted it into codeine by heating it with sodium ethylate and methyliodide. Codethyline (ethyl morphine) was formed when ethyl iodide took part in this reaction; and by the use of alkyl iodides, in general, a series of derivatives was suggested. Ethylen dimorphine was obtained with ethylen iodide. When sulphuric acid, in excess, was added to a solution of morphine in glacial acetic acid with a small quantity of methyal or methylenaceto-chlorhydrine, a purple color appeared in the solution, possibly due to the formation of the base $CH_2C_{17}H_{13}NO_3$ (methylen morphine). — (*Ann. chim. phys.*, 27, 273.) C. F. M. [206

METALLURGY.

Treatment of copper ores at Spenceville, Cal. — The ore, which is fine-grained pyrites in a sort of chlorite slate, is broken into small lumps to prepare it for roasting before being hoisted to the surface. It is then dumped on a few sticks around a loose brick flue, layers of brush are put on at intervals with the ore, salt is distributed through the pile, tank residue placed on the top to exclude the air, and the heap is then fired. The period of roasting lasts six months. There are fifty leach-vats, with a capacity of 120 tons of roasted ore; the leaching is hastened by boiling with steam, and the copper is precipitated by scrap-iron. Forty-two tons of 85% copper cement are shipped monthly; eight months' supply of ore is always kept on hand. There are now 12,000 tons roasting. — (*Min. and sc. press*, Nov. 18, 1882.) R. H. R. [207

Bull's process for iron-smelting. — This process consists in charging the iron-ore and flux, usually limestone, without any solid fuel, gas being used instead; highly heated air is also introduced in sufficient quantity to burn about ten per cent of the gas, and to give high enough heat to melt the charge. The gases rising through the ore are carbonic oxide and hydrogen, with the nitrogen from the air. The usual zone of gasification of the iron-blast furnace is wanting, leaving only the zone of reduction, carburization, and fusion. — (*Min. and sc. press*, Nov. 18, 1882.) R. H. R. [208

GEOLOGY.

Surface geology of the vicinity of Baltimore. — The principal features of the Baltimore area, according to P. R. Uhler, are expressed, first, in the hard rocks of the archaean age; second, in broad beds of softer Jurassic rocks; and, third, in the superficial drift materials. The first series includes the Laurentian system, the chloritic and serpentinic series, and the overlying mica schists and quartzites. These ancient terranes are exposed in plateaus, which

have been shaped by erosion, and have a height of from 300 to 500 feet. Although, in general, similar to the archaean of other regions, yet they are especially rich in hornblendic and pyroxenic rocks; while the highly feldspathic varieties are confined to a few localities, and are usually accessible only at low levels. Baltimore lies on the eastern margin of the broad archaean belt, extending from Canada to Georgia, and having the north-north-east trend of the Atlantic seaboard. It is unbroken westward to the triassic area, and is involved in a series of well-marked folds which attained their maximum development in the Jurassic period.

In the Baltimore area no formations intervene between the archaean and the Jurassic; and the last is represented only by its highest member, the Wealden. It reaches from Elkton, in Cecil Co., to beyond Washington, D. C., with an accessible breadth of about thirty miles. It rests directly upon the archaean, and is overlaid at various points by the cretaceous, tertiary, and post-tertiary; although in the vicinity of Baltimore it is covered only by the drift deposits. The thickness of the Wealden is not less than 500 feet, consisting chiefly of sandstone with beds of clay and gravel, all derived from the archaean, and containing vegetable fossils in abundance; although only one animal has been found, the Astrodon Johnstonii Leidy, a reptile supposed to be related to the iguanodon. — (*Johns Hopk. univ. circ.*, Feb., 1883.) W. O. C. [209

Lithology.

The hornblendic granite of Quincy, Mass. — Mr. Dodge's paper is valuable as showing in a convenient form the distribution of the granite and its adjacent rocks. The only other thing new in the paper is the assumption of two different granites in the area mapped, for which he advances no evidence, although other observers have in general regarded them as local modifications of each other. The paper is, moreover, by no means an adequate representation of what is known regarding the 'Relations of the Menevian argillites and associated rocks at Braintree and vicinity;' for the author does not show the relation of the known primordial argillite to any other rock (work that had been done before by others), but only the relations of some which he has assumed to be primordial. That these argillites are all of the same age, there is good reason to doubt; for in the Boston basin certain of these are found associated with conglomerates, unconformably overlying other argillites, and holding pebbles of the latter. These two different classes of argillites differ from one another in their lithological characters; and that difference, coupled with the association with conglomerates, occurs in Mr. Dodge's so-called Menevian argillites. — (*Amer. journ. sc.*, Jan., 1883.) M. E. W. [210

Meteorites.

The Lodran meteorite. — The microscopic and general characters of this meteorite which fell at Lodran, India, Oct. 1, 1868, were quite fully described by Tschermak in 1870 (*Sitzungsb. akad. wissensch. Wien*, 1870, lxi.). Dr. Stan. Meunier finds, on studying a section, that it appears to be composed of bronzite, olivine, pyrrhotite, chromite, and grains of metallic iron. If, however, a chip is heated and then suddenly plunged into mercury, the silicates fall to pieces, while the metallic portion is seen to form a very fine network or sponge-like mass. This network is the same as, but finer than, that formed by the iron in the celebrated Pallas meteorite, to which this is allied. Dr. Meunier regards the Lodran meteorite as a true sandstone, having a metallic cement. The metallic portion was evidently posterior to the accumulation of the silicate grains, which must, before their cementation, have formed a true meteoric sand. He does not regard water action necessary to produce such a sand, but thinks, rather, that it was produced by volcanic action. — (*Comptes rendus*, xcv. 1176.) M. E. W. [211

Two Japanese meteorites. — Dr. Edward Divers describes two meteoric stones supposed to have fallen in Japan about 150 years ago. They are covered largely with the thin black fused coating common in meteorites, but in the interior are light gray in color, earthy, porous, somewhat soft, and interspersed with particles of iron and pyrohotite (troilite). The chemical analysis is as follows: —

Sp. gr., 3.62

O.	33.18	Al.	1.00
Fe.	26.13	Na.	0.72
Si.	17.15	Mn.	0.57
Mg.	14.02	Cr.	0.28
S.	2.15	Sn. } C. }	0.15
Ni. } Co. }	1.99	P.	0.15
Ca.	1.39	K.	0.13
		Total	99.01

This is the common composition of the chondritic meteorites. — (*Trans. asiat. soc. Japan*, x. 199.) M. E. W. [212

The meteorite of Mocs. — Attention is called by Mr. E. Döll to the form and surface of this meteorite, thinking that it fell in a region that with other meteorites forms a remarkable zone of falls. — (*Verhandl. k.-k. geol. reichsanst.*, 1882, 159.) M. E. W. [213

MINERALOGY.

Mispickle. — As a result of simultaneous crystallographic and chemical investigations, A. Arzruni and C. Baerwald have shown that the prismatic angle of this mineral varies, and is accompanied by a corresponding variation in sulphur. For an increase of 0.00001 in the axis $\breve{a}$ there is an increase of 0.0236 % S, the length of the axis $\breve{a}$ in the varieties investigated varying from 0.67092 to 0.68964, and the sulphur content from 18.051 % to 22.472 %. Thus the mineral does not possess a constant composition, but varies in such a way as to have a definite effect upon the prismatic angle. — (*Zeitschr. kryst.*, vii. 337.) S. L. P. [214

Minerals from Juliane-haab, southern Greenland. — The following minerals have been described and analyzed by Joh. Lorenzen: —

Microcline feldspar.

Arfredsonite. This occurs in dark cleavable masses, hardness 5.5, G. 3.44, showing brilliant prismatic cleavage at an angle of 124° 22′; also grayish and of a more decomposed appearance. Chemical analysis of the dark cleavable variety showed that the iron was nearly all present as protoxide. The analysis agreed with the formula $11\,R\,Si\,O_3 + R_2\,O_3$, showing that the mineral holds a position among the amphiboles which contain a small quantity of sesquioxides.

Ainigmatite. A mineral resembling the above, with prismatic angle 114°, G. 3.80, is regarded as a distinct species, but no analysis is given.

Aegirine. This mineral occurs with arfredsonite, and is to be distinguished by the striations parallel to the prism; prismatic angle 86° 58′, hardness 5.5–6, and G. 3.63. Chemical analysis showed that the iron exists mostly as sesquioxide, and gave the formula $Na_4\,R''\,R^{iv}{}_4\,Si_8\,O_{25}$; or, —

$$\left.\begin{matrix} 2\,Na_2\,Si\,O_3 \\ R''\,Si\,O_3 \\ R^{iv}{}_4\,Si_5\,O_{16} \end{matrix}\right\}, \text{ where } \left\{\begin{matrix} Ca : Fe = 2 : 3. \\ Al_2 : Fe_2 = 1 : 11. \end{matrix}\right.$$

As will be seen, the mineral is a little too basic for a bi-silicate.

Sodalite. This mineral is always colored green, arising from inclusions of arfredsonite. The crystals are dodecahedral, usually about the size of a pea; hardness 5.5–6, G. 2.31. The mineral decomposed by acids, and filtered from the undecomposed inclusions, gave upon analysis the formula $\left\{\begin{matrix} 2\,Na\,Cl. \\ 3\,Na_2\,Al_2\,Si_2\,O_8. \end{matrix}\right.$

Nepheline. This occurs in hexagonal prisms, seldom larger than a hazel-nut, terminated by a pinacoid; also massive, accompanied by the foregoing minerals. G. of crystals, 2.60; massive, 2.63. The results of analysis gave the formula $R'_2\,Al_2\,Si_2\,O_8$; which, although once accepted, has now given place to the more complicated $R'_8\,Al_8\,Si_9\,O_{34}$.

Endialyte occurs crystallized and massive. The crystals show a great number of planes. Hardness 5.5, G. 2.85. The author has determined the oxides of the cerium metals, amounting together to 2.27 p. c. He also finds an unusually large quantity of $Na_2O = 15.90$ p. c., and 1.91 p. c. Cl. The formula deduced from the analysis varies from that of Rammelsberg, and the large percentages of Na_2O and Cl may be due to inclusions of sodalite.

Lievrite. This mineral as occurring in Greenland is described for the first time. It occurs both massive and crystalline, the crystals much striated, and terminations usually wanting. Lustre, metallic; color, black; hardness, 6; and G. 4.05. The results of analysis gave SiO_2 29.30, Fe_2O_3 20.30, FeO 33.50, MnO 1.97, CaO 13.71, H_2O 1.90 = 100.68, giving the formula, —

$$\left\{\begin{matrix} 2\,Fe''_2\,Si\,O_4 \\ Ca_2\,Si\,O_4 \\ Fe^{iv}_2\,Si\,O_5 \end{matrix}\right\} + H_2O;\ \text{or, } H\,Ca\,Fe''_2\,Fe^{iv}\,Si_2\,O_9.$$

Lepidolite. This occurs in white shining laminae, of hardness 2.5, G. 2.81. The analysis is peculiar in containing no fluorine, a very large quantity of alkalies, and only one-half the usual quantity of alumina. It does not agree closely with any definite formula.

Steenstrupine. Under this name a new mineral is described, of a brown color, hardness 4, G. 3.38. It occurs crystallized and massive. The crystals are much curved, and are referred to the hexagonal system. The composition is complicated, as will be seen from the following analysis: Ta_2O_5 0.97, SiO_2 27.95, ThO_2 7.09, Fe_2O_3 9.71, Al_2O_3 2.41, Ce_2O_3 10.66, $(La\,Di)_2O_3$ 17.04, MnO 4.20, CaO 3.09, Na_2O 7.98, H_2O 7.28 = 98.38. Disregarding the Ta_2O_5, these values agree quite closely with the following formula: $Na_2\,R''\,R^{iv}_2\,(Si\,Th)_4\,O_{13}$, $3\,H_2O$. The author, however, making use of the old form of the oxides (Th O, Ce O, etc.), could see no relation between the metals present, and does not attempt to deduce any formula, reserving that till more analyses are made. — (*Min. mag.*, v. 49.) S. L. P. [215

METEOROLOGY.

Popular weather prognostics. — A paper by R. Abercromby and W. Marriott has been read before the English meteorological society, which "explains over a hundred prognostics, by showing that they make their appearance in definite positions relative to the areas of high and low atmospheric pressure shown in synoptic charts. The method adopted not only explains many which have not hitherto been accounted for, but enables the failure, as well as the success, of any prognostic, to be traced by following the history of the weather of the day on a synoptic chart. The forms discussed are: cyclones, anticyclones, wedge-shaped and straight isobars. The weather in the last two is now described for the first time." The paper has not yet been published in full. — (*Nature*, Jan. 4, 1883.) W. U. [216

Observations at Geneva and Great St. Bernard. — The meteorological *résumé* for 1881 by M. Kammermann is an admirable model, worthy of imitation by those who publish similar observations. The diurnal variations in temperature and vapor tension are expressed analytically by Bessel's formula. The amplitude of barometric changes at Geneva exceeded that at St. Bernard by 1.14 mm., while the rainfall at the latter station was more than one-third greater than that at the former. It would be an improvement if the meteorological year adopted coincided with the civil year instead of beginning with December. — (*Arch. sc. phys. nat.*, Dec. 15, 1882.) W. U. [217

PHYSICAL GEOGRAPHY.

Depths of the sea. — Dr. Georg v. Boguslawski has prepared the following table of the greatest trustworthy depths found, up to 1882, in the several oceans and seas: —

	Latitude.	Longitude.	Metres.	Vessel.	Commander.	Date.
North Atlantic	19° 41′ N.	65° 7′ W.	**7086**	Challenger	Nares	1873
South Atlantic	19° 55′ S.	24° 50′ W.	6006	Essex	Schley	1878
North Sea	Near Neerstrand, Norway.		687	Pommerania	Hoffmann	1872
Baltic	N. W. of Gotland.		325	"	"	1871
Mediterranean	35° 5′ N.	18° 8′ E.	3968	—	—	—
Gulf of Mexico	25° 8′ N.	87° 18′ W.	3875	Blake	Sigsbee	1878
Caribbean Sea	20 miles S. of	Gr. Cayman.	6270	"	Bartlett	1880
North Pacific	44° 55′ N.	152° 26′ E.	**8513**	Tuscarora	Belknap	1874
South Pacific	11° 51′ S.	78° 45′ W.	6160	Alaska	"	1881
China Sea	17° 54′ N.	117° 14′ E.	3840	Challenger	F. Thomson	1875
Sea of Japan	11° 24′ N.	143° 16′ E.	**8367**	"	"	1875
Sulu Sea	8° 32′ N.	121° 55′ E.	4663	"	Nares	1874
Celebes Sea	5° 42′ N.	123° 34′ E.	4755	"	"	1874
Banda Sea	5° 24′ S.	130° 37′ E.	5120	"	"	1874
Coral Sea	16° 47′ S.	165° 20′ E.	4850	"	"	1874
Indian Ocean	16° 11′ S.	117° 32′ E.	5523	Gazelle	v. Schleinitz	1875
Southern Ocean	62° 26′ S.	95° 44′ E.	3612	Challenger	Nares	1874
	65° 42′ S.	79° 40′ E.	3060	"	"	1874
Arctic Ocean	78° 5′ N.	2° 30′ W.	4846	Sofia	v. Otter	1868

(*Verh. ges. erdk. Berlin*, 1882, 424.) W. M. D. [218

Playas and playa-lakes. — I. C. Russell, of the U. S. geological survey, describes the abandoned shore-lines and shallow wet-weather lakes of the Utah desert region. The deposits formed in the old lakes are of two kinds: first, those formed in broad, open basins, — soft, fine, greenish saline clays, tenacious when wet, and commonly saturated with alkaline water a few feet below the surface: second,

deposits of small basins without outlet, — fine, loose, light-yellow silt, white when dry. In both of these, the coarser beds wedge out away from their source. The old Playa beds, indicating a time of desiccation, may be covered with true lake-beds, showing a more moist climate. — (*Pop. sc. monthly*, Jan., 1883.) W. M. D. [219

GEOGRAPHY.

(*Arctic.*)

Nelson's explorations in the Yukon delta. — The long residence of Mr. E. W. Nelson at St. Michaels, Norton Sound, Alaska, and the large collections obtained there by him for the National museum, are matters generally known, not only to those immediately interested, but also to the general public. His report has been anticipated with much interest. Unfortunately a too enthusiastic application to study, on his return, acting on a constitution perhaps somewhat weakened by past hardships, produced symptoms which rendered a change of scene and climate imperative as a preventive of worse evils. Mr. Nelson is now recuperating in Colorado, and is still working on his report, which will appear among the professional papers of the signal-corps of the U. S. army, but will be somewhat delayed. During his service as signal-corps observer at St. Michaels, he took part in several long sledge expeditions over little-known parts of the Yukon delta, and was able to gather a large amount of information on the geography of an area in regard to which no authentic data are on record. This information is, of course, of an approximate nature only; but, such as it is, it forms an important and valuable addition to our knowledge. Most of Mr. Nelson's notes were placed in the hands of the authorities of the U. S. census, and form the larger proportion of the new information contained in the map of Alaska lately issued by that office. Pending the publication of his complete report, he has prepared a brief account of the most important of his expeditions made in December and January, 1878–79, which has just appeared in the proceedings of the Royal geographical society of London (November number), together with a map embodying his additions to the geography of the Yukon delta. The journey in question extended from St. Michaels along the coast to the trading-post of Andreievski, at the northernmost mouth of the Yukon, thence by the Kusilvak mountain, across the delta to the vicinity of Cape Rumiantzoff, then near the coast and parallel with it to Cape Vancouver, and around to the mouth of the Kuskokvim River, the western bank of which was traversed some fifty miles northward; then the party struck across the portage to the southern bend of the Yukon, which was descended to Andreievski, after which the original route was followed to St. Michaels. Among the more important features developed were the form of the coast about Cape Rumiantzoff; the number and approximate position of the streams and inlets entering the coast between that point and the mouth of the Kuskokvim; the insulation of Cape Vancouver, which forms part of a large island separated by the large, newly named Baird Inlet, and two broad but probably shallow channels from the mainland; and the approximate location of numerous inland lakes, streams, and villages of natives. Numerous ethnological details appear in the narrative. The island off Cape Vancouver has appropriately been named Nelson Island, and a bay north of it Hazen Bay, after the present enlightened head of the signal-corps, who has done so much to promote research and exploration in these northern regions. W. H. D. [220

(*North America.*)

March of the centre of our population. — This question is discussed by L. Simonin on the basis of our census-reports; of which he says, "Four or five years are given to discussing the data, formulating the results, and illustrating them with splendid maps, making a number of magnificent folio volumes, which are distributed very generously." After describing the exceptionally rapid growth of population, and the westward advance of its centre at the rate of fifty miles a decade from the Chesapeake in 1790 to Cincinnati in 1880, he asks, "When will the centre of population agree with the centre of surface, and what will the population be then?" The answer is: in 320 years, or in 2200 A.D., this change will be accomplished, with a total of 1,600,000,000 souls, — more than the present estimated population of the world. There is, of course, much chance of error in the calculation. It was objected, that Africa might some day turn away the tide of emigration from the United States; but M. Simonin thinks it will not be Africa's turn till America is filled, and that it will never offer the opportunities found here. It was further objected, that Chinese immigration might vitiate the calculations. M. Simonin answers, that this source of increase has been but small, and is now stopped by law. Emigration from the United States is not considered sufficiently probable to affect the result. — (*Bull. soc. géogr. Paris*, 1882, 557.) W. M. D. [221

(*Europe.*)

Finland. — Max Buch prefixes an historical account of the political condition of Finland, with a brief description of the country. On the north-west, where highest, two peaks rise to about 2,000 feet altitude; thence to the south-east the country descends, the heights generally wooded, and the valleys well cultivated. The numerous lakes are mostly narrow, and are dotted over with countless little wooded islands. Of these, Lake Saima serves as a type, extending from latitude 61° to 64°, and yet often no wider than an ordinary river. Besides these larger lakes, there are countless smaller ponds, often separated only by narrow necks of land. The streams are rapid, with numerous falls; those of the Imatra, the outlet of Lake Saima, being renowned. The shore-line is deeply indented, giving many harbors, which are further protected by a fringe of plentiful islands. The climate is relatively mild, the average temperature of Abo, on the southern coast, being 4.6° C., and that of the northern coast —2.6° C. In climate and vegetation Finland differs less from Italy than from southern Greenland, though in the latitude of the last-named country. The population is about 2,060,000, with 40,000 more women than men. — (*Ausland*, 1882, 910.) W. M. D. [222

Hungarian census. — Tables and charts prepared by Ignaz Hátsek from the census of 1880 show a total population, under the Hungarian crown, of 15,642,000, with 236,000 fewer males than females (1,000 to 1,031); a total area of 324,000 □ kilometres; and an average of 48 inhabitants to the □ kilometre, — an average increase of 1.4 per cent since 1870. One-half the population belong to the Roman-catholic church; next come the Greek oriental, the reformed, the Greek catholic, and the Augsburg evangelical. Hungarian is spoken by four-tenths of the population, Croato-Servian and Rumanian by one-seventh each, German and Slovak by one-eighth. — (*Peterm. mittheil.*, 1882, 447.) W. M. D. [223

(*Asia.*)

Russians and English in western Asia. — The reading of an account of Lessar's second journey in

the Turkoman country, before the Royal geographical society last November, was the occasion of an interesting discussion on the old question of the meeting of Russian and English forces in western Asia. Sir H. Rawlinson gave high praise to Lessar's work as novel and accurate. The 'great mountain chain' which the optimists contended would protect India turns out to be a "paltry line of sandstone hills, not 1,000 feet in height, which could be crossed by a carriage-road in a couple of hours, and which would crumble before the touch of a Russian railway-engineer." He thought the present desert into which the Tedjend and Murgab flow was formerly a lake, known to the ancients as the *Aria Palus*, from which there was water-way to the Caspian. An important aid in the disappearance of the lake was probably the diversion of a branch of the Oxus from it into the Aral. He admitted that recent Russian conquest had done much in stopping robbery and suppressing the slave-trade, but thought that Afghanistan was 'beyond the scope of her influence and action,' and hoped that Lessar's project of a railway from Askabad to Herat might not be realized. Sir Bartle Frere thought the sooner the English railway-engineers pressed forward from India to meet the Russians, the farther off would be the day when the military engineers would meet. Sir H. Norman and Sir R. Temple thought the meeting would not come in their time, and that construction of railways across Afghanistan by either outside power would be difficult, and would be prevented by international agreements. — (*Proc. roy. geogr. soc.*, 1883, 12.) W. M. D. [224

(*Africa.*)

Stanley and Brazza on the Kongo. — The dispute between these explorers concerning the possession of certain trading-posts on the Kongo illustrates the activity of modern African exploration, and its commercial inportance. Brazza made a treaty in 1880, with the people on the west bank of the Kongo about Stanley Pool; whose chief, Makoko, put himself under French protection, and ceded a strip of land on the west shore of the Pool for the establishment of a trading-post, named Brazzaville. The explorer concludes that a railroad must be built to this station, and, after very insufficient examination of the route, decides that it should leave the coast near Loango, and extend almost directly eastward up the Kuilu and its branch the Niari, and over a low mountain range to the Kongo, about two hundred and fifty miles.

The expedition from which Stanley returned last year was fitted out in 1879, chiefly by the liberality of the king of Belgium, with the object of opening a free way for trade up the Kongo to inner Africa. The most difficult part of the undertaking was the building of a road from Vivi, just below the first falls of the Kongo, 230 miles up the valley to Stanley Pool, above which the river is again navigable; and after many difficulties this was completed in 1881. During this work, near the end of 1880, Stanley met Brazza coming down the valley; but the latter said nothing about his treaty with Makoko. Six months later Stanley reached the Pool, and was at first well treated by the natives; but soon such startling reports about him were spread by Malamine, whom Brazza had left there to construct the trading-station, that he was forced to retire under the protection of a friendly chief on the southern shore of the Kongo. He descended the left bank to Mandjanga, where he collected his boxes and cases, and returned to the Pool. The station-house of Leopoldville was finished there in February, 1882; and then Stanley completed his trip by a long excursion up the Kongo in a small steamboat that he had brought up over his road, reaching a point 700 miles above the river-mouth.

Stanley condemns Brazza's action in claiming the country about the Pool for France; because he was sent out by the International African association, and had no right to acquire possessions for France alone. Brazza asserts that he was provided with a hundred thousand francs from the French government, and that he had no other support. (*Ausland*, 1882, 861, 894.) W. M. D. [225

Abyssinia. — In a short *résumé* of his trip from the Red Sea to Lake Tana (Tsana) and back, by the way of Adua, G. Rohlfs makes frequent mention of the small population now in this country, in spite of its being well enough watered, supporting a sufficient plant-growth, and not appearing unhealthy: it seems to result from the frequent wars that have latterly been fought with the Egyptians. Rohlfs criticises the map about Adua by Schimper, published in the Zeitschrift der gesellsch. f. erdkunde (Berlin), vol. iv., as absolutely valueless. The article is accompanied by a valuable map, prepared by Hassenstein, of the Abyssinian plateau, showing the routes of its various explorers. — (*Peterm. mitth.*, 1882, 401.) W. M. D. [226

(*Pacific Ocean.*)

Tahiti. — R. Beltrán y Rózpide begins a description of this group of islands, with an account of their discovery and synonymy, and a brief description of the several islands. Tahiti, the largest, has an area 1,042 sq. kil., with peaks rising to 2,236 met. (*Orohena*), 2,104 (*Pitohiti*), and 2,064 (*Aorai*). Although of volcanic rock, none of the summits have crater form. In a deep valley lies Lake Uaihiria, at an elevation of 431 met., without visible outlet: it is considered either a landslip or a crater lake. Around the shore of the island is a fertile and well-cultivated plain, for which the following data are the chief climatic factors, based mostly on observations by Harcouet at Papeite in 1878. The mean temperature is 26° C.; the daily variation is about three degrees, and the annual about twelve, ranging from an average of 19° and a minimum of 15° in June, July, and August, to an average of 31° or 32° from December to March. The sea-water has an almost constant temperature of 28° or 29°, the streams from the mountains vary from 20° to 23°, and in the elevated interior the thermometer sometimes falls to 8°. The barometric mean is 759.85 mm., with a maximum of 764 and a minimum of 756.9 mm. The winds are generally from the east, but sometimes come from south-east or south-west, and then bring rain. At night there is, as a rule, a cool breeze from the interior. Rain is heaviest on the south-east; but the measures were taken on the other side of the island, and showed 91 rainy days, and a fall of 1,200 mm. in the wet season from December to April, accompanied by low pressure, calms, and gusts, and 199 mm. of rain on 23 days of the dry season from April to December. The rains are much less frequent and heavy on the coast than in the interior, where they produce high floods in the steep valleys. Among the peculiarities of the island's fauna may be mentioned the climbing crab (Birgus latro), which climbs the cocoa-palms to cut off and drop the young fruit, then descends, and carries the nuts to the shore, where it breaks and eats them. Further details of the flora and fauna are given. The population of the group was estimated about 100,000 in the last century, but this was doubtless incorrect. More trustworthy counts about 1820 gave 10,000 to 15,000; in 1848, 9,967; in 1857, 7,200; in 1862, 10,147; and the last, in 1879, 10,978. — (*Bol. soc. geogr. Madrid*, xiii. 1882, 247, 387.) W. M. D. [227

BOTANY.

(*Structural and physiological.*)

A general method for examining vegetable tissues. — E. Fremy has contributed much to our knowledge of the cellulose group of organic substances. In a paper lately republished, he has brought together the more important reactions presented by the members of the group, and has followed this by a memoir in which M. Urbain has assisted. From both papers the following results are now summarized. The substances which form the skeleton of plants are principally pectose and its derivatives, cellulose and its isomers, vasculose, and cutose. *Pectose* acted on by alkaline carbonates is changed into pectates. These are decomposed by hydrochloric acid, which throws down gelatinous, insoluble pectic acid. *Cellulose* and its isomers agree in being readily soluble in concentrated sulphuric acid, but differ in the following points: cellulose dissolves at once in cuprammonia; paracellulose, only after the action of acids; metacellulose, not even then. *Vasculose* is not easily soluble in concentrated sulphuric acid, but, after the action of oxidizing agents, forms resinous acids separable by alkalies from associated cellulose. *Cutose*, the transparent membrane covering the aërial organs of plants, is dissolved neither by concentrated sulphuric acid nor by cuprammonia; but it dissolves rapidly without change in dilute alkaline liquids.

Following the facts above summarized, the authors give results of their analysis of different organs of plants, a few of which are herewith given: —

Root of Paulownia. — 1°. Substances soluble in water and in dilute alkalies: cork 45, soft bast 56, body of root 47. 2°. Vasculose: cork 44, soft bast 34, body of root 17. 3°. Paracellulose: cork 4, soft bast 4, body of root 30.

Stems. — Vasculose increases in amount with density of the wood. The pith contains of cellulose 37, paracellulose 38, vasculose 25 per cent. Cork contained: matters soluble in acids and alkalies 5, cutose 43, vasculose 29, cellulose and paracellulose 12 (cutose and vasculose forming together the *subérine* of Chevreul).

Leaves of ivy. — Water and substances soluble in neutral solvents 707.7, parenchyma (formed of cellulose and pectose) 240, fibres and vessels (formed of vasculose and paracellulose) 17.3, epidermis (cutose and paracellulose) 35.

Petals of Dahlia. — Water and soluble matters 961.30, parenchyma (of cellulose and pectose) 31.63, vasculose 1.20, paracellulose 2.27, cutose 3.60.

These interesting results throw considerable light on some obscure micro-chemical reactions, particularly the behavior of tissues with cuprammonia and with alkalies. With the authors' notes relative to the bearing of their results on technical chemistry, this notice cannot deal. — (*Ann. sc. nat., bot.*, 1882, 360.) G. L. G. [228

Fertilization of alpine flowers. — During a residence of several years at Grenoble, M. Musset has paid attention to the relative abundance of flowers and insects, finding all orders of insects well represented as high as 2,300 metres. Above this altitude Lepidoptera, Diptera, and certain Hymenoptera preponderate, as Dr. Müller and others have also observed. Flower-frequenting insects are found at all altitudes, in proportion to the abundance of entomophilous flowers; their visits being determined by several causes, the state of the atmosphere being one of the most important. It is stated that the waking hours of nyctitropic flowers and of insects are identical. — (*Comptes rendus*, Aug. 7.)

M. Heckel does not attach much importance to the visits of insects in the evolution of the large flowers characteristic of many alpine plants. He believes, in common with Bonnier and Flahault, that the more intense solar radiation is the chief factor in causing the larger size of flowers at high altitudes. — (*Ibid.*, Dec. 4.) W. T. [229

Pollination of Rutaceae. — In a paper read before the Linnean society of New South Wales, on plants found about Sydney, Mr. Haviland discusses the protandry of Philotheca australis and Boronia pinnata. The stamens are situated at first so as to bring the anthers over the immature stigma, as in other Rutaceae; this position insuring cross-fertilization with little waste of pollen. It is suggested, that, as they thus prevent the stigma from receiving the maximum of light and heat, their position may aid in retarding its development, and thus cause the protandry. — (*Nature*, Dec. 28.) W. T. [230

Value of crossing in plants. — For a number of years Prof. W. J. Beal of the Michigan agricultural college has been carrying on the work of experimentally testing the effects of cross and close fertilization so ably begun by Mr. Darwin. Most of his experiments have related to indian corn. As was to be expected, the results of no two years' experiments correspond at all closely; but they all show a marked gain when plants raised from seed grown some distance apart are inter-crossed instead of being allowed to self-fertilize. The average of four years' experiments shows the gain to be 27%. The least gain was a trifle under 10%; the greatest, 51%. One year's experiment with wax beans showed a gain of 136%. — (*Amer. journ. sc.*, Dec.) W. T. [231

Vegetable fly-trap. — Potonié finds that the feet of small flies that alight on the leaves of the West Indian Desmodium (Pteroloma) triquetrum are caught in the curves of the fine, arched leaf-hairs, so that their most desperate efforts to escape are unavailing. The insects captured belong to the genus Chloria. House-flies, with larger feet, are not captured; while ants and plant-lice have such small feet that they can walk over the leaves with impunity. The plant appears to derive no benefit from the death of its victims, which starve to death in captivity. — (*Kosmos*, Nov.) W. T. [232

(*Systematic.*)

New orchid in Florida. — The tropical Epidendrum cochleatum has been discovered by W. W. Calkins, growing upon the live-oak, at Jupiter Inlet, on the Atlantic coast of Florida. — (*Coult. bot. gaz.*, Dec., 1882.) S. W. [233

Western grasses. — A list, by F. L. Scribner, of the grasses recently collected by Pringle in Arizona and California, is accompanied by critical notes and descriptions of the rarer species. — (*Torr. bot. bull.*, Oct. and Dec., 1882.) S. W. [234

American conifers. — A popular account, by Dr. George Vasey, of the distribution and characteristics of the coniferae of the United States and Canada. — (*Amer. journ. for.*, Dec., 1882, and Jan., 1883.) S. W. [235

The tonga plant. — The drug tonga is shown by N. E. Brown to be the product mainly of a climbing aroid (Epipremum mirabile, Schott), widely distributed through the East-Indian Islands to Australia and Fiji. The plant has been hitherto involved in much confusion botanically; and a full description is given, with detailed synonymy. — (*Journ. bot.*, Dec., 1882.) S. W. [236

ZOÖLOGY.

Coelenterates.

Research on the lower invertebrates, during the years 1876–79. — The many American students who have no means of access to the journals of foreign learned societies, or to the periodical literature of zoölogy, will find, in Prof. Leuckart's summary of the work done upon the coelenterates during the years 1876–79, a very valuable abstract of the literature of this subject. Even the favored few who are able to consult the original works should be thankful to Prof. Leuckart for his brief but perfectly intelligible digests. — (*Arch. naturgesch.* xlv. ii. 591.) W. K. B. [237

Development of the tentacles of Hydra. — The great variability of fresh-water hydras demands that the order of development of the tentacles should be tabulated in a great number of specimens, in order to discover the law of their appearance. Jung has thus studied nearly two hundred and fifty specimens of three species; and he concludes, that, while there is no fixed order, each species does have a typical or average mode of development, which is more or less closely followed by the majority. The law varies with the species, and the results of Jung's researches are shown in the following diagrams: —

Hydra grisea.	Hydra oligactis.	Hydra viridis.
6	3	1
4 | 3	6 | 5	5 | 4
2 | 1	2 | 1	8 — 3 | 2 — 7
5	4	6
6	3	4
4 | 3	1 | 5	8 | 5
2 | 1	6 | 1	1 — 6 | 7 — 1
5	4	3

The vertical line is that axis of the bud which passes through the axis of the parent, and the upper end is the one nearest the body of the parent. The upper series of diagrams shows the typical order of appearance in normal buds of the three species named. This order was followed in 46% of 156 specimens of H. grisea, in 83% of 7 specimens of H. oligactis, and in 55% of 21 specimens of H. viridis. The second line shows the order of re-appearance in specimens after cutting off the oral end of the body with the tentacles. It was followed in 69% of 48 specimens of H. grisea, in 3 specimens of H. oligactis, and in 57% of 12 specimens of H. viridis. — (*Morph. jahrb.*, viii. 339.) W. K. B. [238

Mollusks.

Trade in Californian invertebrates. — Apart from the trade in oysters, clams, and other ordinary economic mollusks, there are certain specialities peculiar to the Pacific coast which do not appear in the trade-reports of other countries. Among these are 'abalones' (Haliotis californianus and H. splendens), the Californian pearl-oyster (Meleagrina californica), and several pearly univalves (Trochiscus Norrisii and Pachypoma gibberosum), small shells for ornamental purposes, and dried shrimps and shrimp-shells. The last are prepared by the Chinese, who catch them in large quantities, in nets of extremely fine mesh, by which very many small fish are also destroyed. The shrimps are dried on a mat over an open fire, and when thoroughly desiccated are threshed, the meats separated from the shells, and packed separately. The meats are used as food by the Chinese in all parts of the world. The shells are a particularly energetic fertilizer, superior to guano, and are packed in bundles of about 100 pounds weight for exportation to China. The various pearl-bearing shells are used for ornamental purposes, especially buttons. The export of abalones from San Francisco, by sea, in 1882, according to the annual 'market review,' was 4,638 sacks, valued at $23,455, against 4,522 sacks in 1881. They were exported to Germany (50 sacks), China (1,116 sacks), Hawaiian Islands (65 sacks), England (2,982 sacks), and New York (425 sacks), beside shipments eastward by rail. England received 563 barrels of pearl-oysters, and 49 barrels of other shells. The Chinese in South America received 99 packages of shrimp-meats, and those in the Hawaiian Islands 8 packages; while the enormous quantity of 9,611 packages of shrimps and shrimp-shells were sent to China. — W. H. D. [239

Crustaceans.

Paleozoic allies of Nebalia. — Having discussed its anatomy and development in a previous article, Prof. Packard compares Nebalia with the published figures of some of the paleozoic Ceratiocaridae, and concludes that the fossil forms should be separated from the Nebalidae as a distinct sub-order of Phyllocarida. Diagnostic characters are given for the order, and differential characters separating them from other crustacea. The memoir is to appear in full in Hayden's Twelfth report of the survey of the territories. — (*Amer. nat.*, Dec., 1882.) S. I. S. [240

New Devonian Crustacea. — J. M. Clarke describes and figures a new genus (Dipterocaris), and three new species of Ceratiocaridae from the Devonian, and remarks upon the characters of Spathiocaris and Lisgocaris, and on the wide range of S. Emersonii. — (*Amer. journ. sc.*, Feb., 1883.) [241

Shrimp and prawn fisheries. — In an article on the shrimp and prawn fisheries of the U. S., Richard Rathbun enumerates and remarks upon the edible species, makes suggestions in regard to the capture of some New-England species not now used for food, and then gives a general account of the fisheries of the Atlantic and Gulf, and the Pacific coasts. — (*Bull. U.S. fish comm.*, 1882, 139.) S. I. S. [242

Parasitic Copepoda. — R. R. Wright describes and figures in detail three species from fresh-water fishes of Canada. He seems to be unacquainted with the descriptions of allied North-American species by Kröyer, Smith, and Packard, with which his species should have been compared. — (*Proc. Canadian inst.*, n. s., i. Dec., 1882.) S. I. S. [243

Crustacean allied to Willemoesia. — C. Spence Bate describes a new genus and species (Eryoneicus caecus), taken in 1,675 fath., off the Canaries, by the 'Challenger.' It "approximates closely to Pentacheles, and adds another link between that and Eryon." — (*Ann. mag. nat. hist.*, Dec., 1882.) S. I. S. [244

Terrestrial Isopoda. — A. E. Eaton states, that Platyarthus Hoffmanseggii, which is found in ants' nests, and is reputed to be blind, is provided with eyes, and is as sensitive to light as other Oniscidae. — (*Ann. mag. nat. hist.*, Dec., 1882.) S. I. S. [245

Fauna of mountain lakes. — A. Wierzejski gives an account (in Polish) of the fauna of the lakes of the Tatra mountains, enumerating eighty species, of which forty-three are crustacea. Eight species of Cladocera and Copepoda are figured, but no new species are named. — (*Spraw. kom. fizyjogr. akad. umiej., Krakow*, xvi., 1882.)

The same author figures and describes the anatomy of Branchinecta paludosa, from the same region, and discusses its geographical distribution. — (*Rozpr. akad. umiej. wydz. matem-przyr., Krakow*, x., 1882.) S. I. S. [246

Insects.

Histology of insect wing-muscles. — The memoir of G. V. Ciaccio, to appear shortly in the Memorie dell' accademia di Bologna, may be thus summarized: In most insects the wing-muscles may be decomposed into fibrillae (in others, into striated fibres: Sphinx, Libellula, etc.). In the former case the fibrillae are united into bundles of various sizes by a cementing substance, in which the nuclei lie either both in the interior and upon the surface of the bundle (Hydrophilus, Dytiscus), or upon the surface only (flies). The bundles are held together by tracheae, and sometimes also by fat-cells. In the cement are further always found distinct particles (Aubert's *masse grumeleuse interfibrillaire*), which do not occur in the other muscles. The fibres are composed of fibrillae, and have nuclei either upon the surface (Cicada) or in the middle (Libellula). In some insects the fibrillae are arranged as in a folded lamella, the leaves of the folds running out from the centre of the fibre towards the surface, seen in cross-sections. The nerve-fibres terminate in motor plates (probably several for each fibre), consisting of a granular basal substance, in which are embedded the ramifications of the axis-cylinder. The wing-muscles are more readily dissociated into fibrillae than those of the rest of the body, from which they are further differentiated by the absence of a true sarcolemma. — (*Arch. ital. biol.*, ii. 131.) C. S. M. [247

Curious gall of a Trypeta. — Weyenbergh found in the Argentine Republic, on the terminal bud of a Heterothalamus, what resembled the froth which is secreted by the 'frog-spittle' insect, Cercopis spumaria L., but which, on touch, proved to be more substantial, or like a raspberry in texture, and on drying became tough like paper. Concealed by the froth was found a larva, which underwent its transformations within the same covert, and finally issued as a fly, which he names Trypeta (Icaria) Scudderi. The formation of the froth was observed in a larva placed on paper; it pressed its terminal segments together with nearly rhythmical movements, and so repeatedly squeezed little drops of clear fluid from the anus, which collected by and by into a frothy mass. — (*Verhandl. zool.-bot. gesellsch. Wien*, 1882, 363.) [248

(*Economic entomology.*)

Effect of pyrethrum upon Plusia brassicae. — Mr. Howard finds that the rate of pulsation of the heart of the larva is greatly increased at once, and falls but little before death. — (*Amer. nat.*, December, 1882.) J. H. C. [249

The cluster-fly. — A fly which has proved to be a great nuisance to housekeepers by entering dwellings in the fall of the year, and assembling in large numbers in beds, under table-covers, behind pictures, and elsewhere, is determined by Dr. Riley as Pollenia rudis Fabr. — (*Amer. nat.*, Jan., 1883; cf. *Psyche*, iii. 378.) J. H. C. [250

Wheat-stalk Isosoma. — Professor French observed, that in two wheat-fields which were in wheat last year ninety-three per cent of the stalks were infested by this insect; in one field which was in clover last year, not more than five per cent were infested. — (*Amer. nat.*, Jan., 1883.) J. H. C. [251

Promoting locust ravages. — It is estimated by Mr. J. P. Brown, that during the winter of 1874 one thousand car-loads of birds were destroyed and shipped to eastern markets from points west of St. Louis, Mo. — (*Psyche*, iii. 380.) J. H. C. [252

Buckeye leaf-stalk borer. — Mr. E. W. Claypole describes the habits of a new tortricid which Fernald names Steganoptycha claypoleana. — (*Psyche*, iii. 364.) J. H. C. [253

Habits of Thrips. — A species of Phloeothrips observed by Mr. Herbert Osborn in fruit-blossoms were doing much damage by injuring the styles, and thus preventing fertilization. — (*Psyche*, iii. 364.)

Although the species of Thrips are doubtless to a certain extent injurious to plants, Mr. Pergande believes that they feed chiefly upon nectar, and that they assist in fertilizing the plants they infest by carrying pollen. One species of Thrips preys upon the red spider. — (*Psyche*, iii. 381.) J. H. C. [254

VERTEBRATES.

The theory of the opening-twitch (Oeffnungszuckung). — An extended study of the opening-twitch leads Tigerstedt to the conclusion that the cause of it, and of the phenomena accompanying it in the nerve, lies in the polarization current, and, with some exceptions, in changes in the normal nerve current. The twitch due to a sudden decrease in the intensity of the polarizing current was not examined, so the above conclusion only applies to cases in which that current was completely broken. — (*Mitth. physiol. lab. Carol. inst. Stockh.*, ii. heft.) H. N. M. [255

Fish.

The development of the hypophysis in Petromyzon planeri. — Recent investigations by Prof. A. Dohrn have led to a different interpretation of the development of the hypophysis of Cyclostomes from that given by W. B. Scott or that of Balfour. The former stated in effect (*Morphol. jahrb.*, vii. 158) that the rudiment of the organ in question was unpaired. Its first appearance is marked by a slight depression above the mouth, which we may regard as the common invagination from which the nasal pit and hypophysis arise. Balfour states (*Comp. embryol.*, ii. 358), "I have observed a slight diverticulum of the stomodaeum, which I believe gives origin to it."

Dohrn holds, that his own more recent observations of the past summer show that the hypophysis arises as an independent invagination of the ectoderm between the nasal and oral invaginations. It has no connection with the latter, in that the upper lip is developed between the oral invagination and hypophysis. — (*Zoolog. anzeiger*, Nov. 6, 1882.) J. A. R. [256

Mammals.

Muscles of the raccoon's limbs. — Dr. H. Allen compares them with those of Felis domesticus. Triceps and some others undergo imperfect planal cleavage, showing imperfect differentiation; the number of nerves is variable, being most abundant in the less specialized muscles; the latter have more nerves in Felis than in Procyon; triceps and some others when normal in Procyon represent abnormalities in man; some are identical in both; others seem to be beyond the limits of variability in man. — (*Proc. acad. nat. sc. Philad.*, 1882, 115.) F. W. T. [257

Myology of Proteles. — M. Watson points out the characteristics of the muscles of Proteles cristatus, and agrees with Prof. Flower that the species should be placed in a separate family, allied to Hyaenidae and Viveridae but more closely to the former. — (*Proc. zoöl. soc. Lond.*, 1882, 579.) F. W. T. [258

Singing mice. — Herr Struck gives some notes upon a singing mouse which lived in captivity ten months. He inclines to doubt Cohen's opinion, that the musical tone is due to disease of the throat, and thinks that the mice may die in consequence of eating too rich food. — (*Arch. ver. freunde nat. Meckl.*, xxxv. 117.) — F. W. T. [259