

that a clear and definite presentation of chemical theories is quite essential to their proper comprehension. While it is manifestly highly important that the student should not only be acquainted with the facts upon which chemical theories rest, but should also appreciate fully the nature of conclusions reached by inductive reasoning, still a constant reiteration of the doubts, uncertainties, or conflicting evidence, which surround the various hypotheses, seems to us ill advised in an elementary text-book.

Although structural chemistry in a certain sense is independent of the valence hypothesis, still this hypothesis was one of the earliest and most natural inductions resulting from the study of the constitution of chemical compounds, and is so interwoven with the present theories, that any attempt to exclude it rigorously from a discussion of the subject merely adds an unnecessary complication. We confess that we do not think the ordinary student will read with much interest the pages devoted to structural formulae, or 'proofs' of their correctness, if he chances to see beforehand the opening sentence of the retrospect which follows (p. 232).

"A study of the preceding chapters on constitution will show that no absolute meaning is to be attached to the word. Constitutional formulas are those which suggest certain reactions, and recall analogies. The formula $\text{CH}_3 - \text{OH}$ does not mean that hydroxyl (OH) is necessarily present in the compound, or that CH_3 is present, but that the different parts of the compound bear such relations to each other that when the compound is decomposed, it acts as if the parts were united as the formula indicates. The formula suggests possibilities; it may not represent realities."

If the author be correct, and "it cannot be denied that we are now in a period of chemistry which may fairly be called one of *formula worship*" (p. 100), it is very certain that formula worship has been of vastly greater service to chemistry than agnosticism is ever likely to be.

We fail to see that any advantage is gained by the introduction of new conventional signs in place of those already in common use, to represent the linkage of the carbon atoms in the olefinet and acetylen series (pp. 202, 206); nor can we understand why the double linkage of the nitrogen atoms, which the author ap-

parently accepts, since he uses the old sign ($=$) in his formulae for the azo- and the diazo-compounds (p. 222), stands upon any more trustworthy experimental basis. Furthermore, we cannot help expressing our surprise that the author should have ventured the statement, "Of the substitution products of benzene, which contain three substituting groups, more than three varieties have been observed" (p. 208), which seems a bit of rashness hardly consistent with the caution elsewhere displayed.

THE CORNELL MATHEMATICAL LIBRARY.

Cornell university library. Special lists, No. 1. Mathematics. Ithaca, N.Y., 1883. 92 p. 8°.

THIS classified list of works, with index, includes some twenty-five hundred titles relating to mathematics, and such allied subjects as astronomy, engineering, and physics. These books form what is known, from the name of the donor, as the 'Kelly mathematical collection.'

An examination of the list shows that it consists of books actually purchased within the past few years, with good judgment, and a conscientious endeavor to cover, so far as practicable, the immense field of mathematical research, past and present, as evenly as possible.

It comprises, besides many rare and valuable works not readily accessible to American students, the collected works of the great masters of analysis, and the more important mathematical journals.

The mathematical capabilities of American youth are quite equal to those of Germany or England; but the facilities offered them by our universities for the study of this grandest of sciences are in general far behind those found abroad. When the professors and teachers of mathematics in this country shall themselves become lifelong cultivators of mathematical pursuits, and shall have the same average proficiency as those abroad, there will be no difficulty in accomplishing results in the mathematical training of college students fully equal to any attained elsewhere. But such professors and such students cannot be without libraries such as this is the beginning of. We can but express our deep satisfaction with this good work in the interest of sound learning.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Kummer's surface.—Professor Cayley, in a brief note 'on the sixteen-nodal quartic surface,' remarks,

that Riemann's theory of the bitangents of a plane quartic leads at once to a very simple form of the equation of the sixteen-nodal quartic surface; viz.,

if ξ, η, ζ , denote linear functions of the co-ordinates (x, y, z, w) , such that identically

$$x + y + z + \xi + \eta + \zeta = 0,$$

$$ax + by + cz + f\xi + g\eta + h\zeta = 0$$

(where $af = bg = ch = 1$), then the quartic surface,

$$\sqrt{x}\xi + \sqrt{y}\eta + \sqrt{z}\zeta = 0,$$

is a sixteen-nodal surface. Prof. Cayley has previously given the equation of this surface under the form

$$\sqrt{x(X-w)} + \sqrt{y(Y-w)} + \sqrt{z(Z-w)} = 0,$$

where $X = a(\gamma'\gamma''y - \beta'\beta''z)$, etc., and $a + \beta + \gamma = 0$, etc.; the other relations being obtained by cyclical interchange of the letters, and by advancing the accents. The object of the present paper is the direct identification of these two forms of the equation of the surface. — (*Journ. reine ang. math.*, xciv.) T. C. [541]

Elliptic functions. — M. Hermite has given a simple and direct demonstration of an interesting relation discovered by Prof. Cayley. The relation is as follows: if u, v, r, s , are four quantities connected by the relation $u + v + r + s = 0$, then we have —

$$-k'^2 \operatorname{sn} u \operatorname{sn} v \operatorname{sn} r \operatorname{sn} s + \operatorname{cn} u \operatorname{cn} v \operatorname{cn} r \operatorname{cn} s = -\frac{1}{k^2} \operatorname{dn} u \operatorname{dn} v \operatorname{dn} r \operatorname{dn} s = -\frac{k'^2}{k^2}.$$

This remarkable relation is shown by M. Hermite to be easily derived by means of certain formulas which he has long used in his course in the Sorbonne. The formulas are those which give the decomposition into simple factors of the three quantities $\operatorname{sn} x \operatorname{sn}(x+a)$, $\operatorname{cn} x \operatorname{cn}(x+a)$, $\operatorname{dn} x \operatorname{dn}(x+a)$. The decomposition of the first of these products is a known fundamental relation between Jacobi's Z-functions: the decomposition of the other two products is given by M. Hermite; and by aid of them Prof. Cayley's formula is proved. — (*Acta math.*, i.) T. C. [542]

ENGINEERING.

The two-cylinder compound engine. — Professor S. W. Robinson furnishes *Van Nostrand's magazine* a paper on the working of steam in this engine in its various forms, and traces the method of distribution in the two cylinders and the effect of such methods on the theoretical efficiency. He gives the general method of representing the action of steam graphically, and shows how diagrams made from the two cylinders are combined. The effect of the receiver is exhibited, and the result of the introduction of various conditions, as clearance, etc. — (*Van Nostrand's mag.*, Oct.) R. H. T. [543]

Spherical steam-engines. — Messrs. Heenan & Froude of Manchester, G.B., recently exhibited at the Engineering and metal trades exhibition, London, their 'Tower' spherical engine, driving an Edison dynamo. The steam-cylinder is a sphere having two cylindrical projections cast upon it. Each of these carries a shaft, only one of which transmits power from the engine, the other having merely to guide the hinged piston nearest it. The pistons divide the interior of the sphere into four portions, which at times are four equal quadrants of the sphere, but which are capable of variation of volume with change

of piston position; and, this being effected by the action of the steam which is let into the several spaces at proper times by the action of the rotating valves which are set in the cylindrical projections, the shafts are turned, and power is produced and transmitted to the mechanism of transmission.

The engine worked silently and well, and indicated 18-horse power at 600 revolutions per minute, with steam at 80 pounds ($6\frac{1}{2}$ atmos.). Its diameter was but 7 inches (17.8 centimetres). — (*London engineer*, July.) R. H. T. [544]

Steel castings. — Mr. W. Parker has collected facts bearing upon the value of steel castings in marine-engine construction. He observes that forged iron shafts and other heavy parts are very unsafe, and that mild steel is taking the place of wrought iron for all such uses. About a hundred and twenty steel ships are in progress in Great Britain, constructed of low steel. The testimony of steel-makers and tests of the material show that steel castings can be made of homogeneous character and thoroughly reliable. Jessop & Co. use crucible steel for this purpose, and think that good castings can only be obtained with certainty by the crucible process. Spencer & Sons use both crucibles and the open-hearth process, and get equally good results from both. The Steel company of Scotland use the Siemens furnace and process, and adopt the silicide of manganese as a flux to insure soundness. The internal stresses due to variation in rate of cooling are avoided either by very slow cooling or by annealing. Pourcelet of Terre Noire, France, tempers in oil, with, as is claimed, very great advantage. The tenacity is thus increased sometimes thirty per cent, and the elongation at rupture remains unreduced, while the grain of the steel is greatly improved. Sir Joseph Whitworth compresses his ingots of steel, while solidifying, by applying the pressure of a large hydraulic press. Messrs. Vickers & Co. make many large crank-shafts for steamships, adopting a mild steel of a tenacity of about fifty-five thousand pounds per square inch. The castings are improved by hammering or rolling, thirty per cent. — (*Scient. Amer.*, Oct. 20.) R. H. T. [545]

CHEMISTRY.

(General, physical, and inorganic.)

Bleaching. — 'Oxygenated water,' a common name for peroxide of hydrogen, has within the last few years attracted a good deal of attention as a bleaching and purifying agent, and has been successfully employed as a substitute for chlorine. It is now stated that Mr. P. Ebell of Pfungstadt, near Darmstadt, has succeeded in preparing economically a product, pure, stable, and of constant strength, capable of being easily transported for long distances, and kept for years without losing its bleaching-properties. Among other applications of this product, that of the decoloration of animal fibres is the most important, as it does not contain some of the disadvantages of other bleaching-agents. For wool or silk, it is advisable, before bleaching, to cleanse the materials thoroughly, so as to eliminate all the greasy substances and impurities. For this purpose, Mr. Ebell recommends a

bath in a solution of five parts carbonate of ammonia to one hundred of water, this bath being followed by a soaping, and thorough washing with water. The bleaching itself is performed either by immersing the materials in the solution of oxygenated water, and leaving them there at a temperature of from 20° to 30° C., until the decoloration is complete, or the materials are impregnated, when they are wrung out and exposed in a room heated to about 20° C.: they are then left to dry. — (*Engineer*, July 20.) [546]

Molecular volume of liquids.—In the determination of the molecular volume of liquids, R. Schiff proposes to make the observations at the boiling-point of the liquid and in a special form of apparatus. The latter consists of a small flask capable of holding about one hundred grams of mercury: it is drawn out to a narrow neck which is graduated to ten divisions, each of which corresponds to 0.01 of a cubic centimetre; and each of these divisions is divided into five parts, making each of the final divisions equal to 0.05 of a cubic centimetre. The volume is accurately determined by weighing the flask filled with mercury to the zero-mark. To determine the specific gravity of any liquid at its boiling-point, the flask is filled with the liquid, placed within a jacket-tube which contains a little of the same liquid, and the latter boiled until the liquid in the flask is heated to its boiling-point. By means of a capillary tube the liquid is withdrawn from the flask until it stands at the zero-mark, and the flask is corked, cleaned, allowed to cool, and weighed. The specific gravity of the liquid is referred to water at 4° C., and it may be calculated by means of the formula—

$$D_t^4 = \frac{P}{V_t(1 + K(t - 4))},$$

in which P = the corrected weight of the liquid in the flask, V_t = the apparent volume which the liquid occupies at t° .

By this method the molecular volume of many of the paraffine and aromatic hydrocarbons, their halogen substitution products, alcohols, etc., were determined, and results were obtained which agreed closely with those of other experimenters. — (*Ann. chem.*, 220, 71.) C. F. M. [547]

AGRICULTURE.

Aves guano.—A new phosphatic material under this name has lately been imported into Germany from the Aves Islands, in the Caribbean Sea, near the coast of Venezuela. Analyses of it by Märcker and by Heiden show it to contain about seventy-two per cent of calcium phosphate, four to nine per cent of calcium carbonate, seven per cent of organic matter, and twenty-five hundredths of one per cent of nitrogen. The material consists of a fine powder, with more or less fragments up to the size of a pea or larger. Among the coarser portions, shells and coral fragments are often found. The extent of the deposit is said to be great. — (*Biedermann's centr.-blatt.*, xii, 582.) H. P. A. [548]

Comparison of nitrogenous fertilizers.—Märcker reports the results of pot-experiments by Albert

on the relative value of various nitrogenous fertilizers for oats. Leather, either unprepared or fermented, gave as good as no increase of crop. The others ranged in the following order, the best being placed first: horn-meal, nitrate of soda, fermented dried blood, sulphate of ammonia, fermented steamed bone, steamed bone, dried blood. The horn-meal is prepared by treating horn-refuse with superheated steam. In previous experiments it produced almost as good an effect as nitrate of soda. It is to be observed, that several of the materials used contained other fertilizing ingredients than nitrogen, of whose possible effect no account seems to have been taken. An experiment in the following year with the pots manured with leather showed no noticeable effect from the latter. — (*Biedermann's centr.-blatt.*, xii, 584.) H. P. A. [549]

Effect of fertilizers on composition of oats—In the experiments reported in the preceding abstract the composition of the oats produced by the aid of the various fertilizers was determined. Those manured with leather and those without nitrogen contained 8.7 % to 10.7 % of proteine; those manured with nitrate of soda and sulphate of ammonia, 11.2 % and 11.1 %; those manured with the blood or bone manures, 11.6 % to 13.6 %. The proportion of crude fibre and ash was greatest in those manured with leather and those without nitrogen: the others showed only slight differences. The nitrogenous manures delayed the ripening of the grain in some cases. Märcker divides them into three groups: 1°, those which allow the grain to ripen at the normal time, their nitrogen being assimilated during the early stages of growth (nitrate of soda, sulphate of ammonia); 2°, those which delayed the ripening somewhat (steamed bone, and the same fermented); 3°, those which delayed the ripening considerably, and rendered it irregular (horn-meal, dried blood). The last decompose slowly in the soil, and furnish a continuous supply of nitrogen until late in the autumn. — (*Biedermann's centr.-blatt.*, xii, 587.) H. P. A. [550]

Nutritive value of amido-compounds.—Weiske has already shown that the asparagine which is found in various fodders, along with other amides and amido-compounds, can partially take the place of proteine in nutrition. Zuntz has repeated his observations on asparagine and other amides, with the same result. — (*Biedermann's centr.-blatt.*, xii, 602.) H. P. A. [551]

Sunflower cake as fodder.—This material has been tested as fodder for milch-cows by Schrodt and von Peter with very favorable results. Slightly more milk was produced by its aid than by that of an equivalent quantity of palm-nut meal; and the proportion of fat in the milk was slightly increased, as has sometimes been the case in feeding palm-nut meal. No injurious effects on the health of the animals were noticed. — (*Biedermann's centr.-blatt.*, xii, 609.) H. P. A. [552]

GEOLOGY.

Lithology.

Lithology of the District of Columbia.—According to Mr. G. P. Merrill, the prevailing rock of

this district is an extremely variable hornblende, chloritic, or micaceous schist, sometimes somewhat gneissoid. This rock is used for building-purposes in its finer varieties, which are composed of quartz and biotite, with a silvery white mica, magnetite, apatite, etc. Besides the quartz and biotite, the coarser varieties frequently contain plagioclase, hornblende, chlorite, apatite, epidote, pyrite, magnetite, garnet, and rutile. The biotite is frequently more or less altered to chlorite, and contains apatite, magnetite, and sometimes infiltrated calcite. — (*Proc. U. S. nat. mus.*, vi. 159.) M. E. W. [553]

The bismuth deposits of Australia.—These deposits are found in irregular quartz veins or 'reefs' in gray granite, and near its junction with the surrounding porphyritic and schistose rocks. The veins are composed of irregular segregations of quartz, holding bismuth, both native and as a sulphide, gold, molybdenite, smoky quartz crystals, etc. These veins occur only in circumscribed patches in the granite, which has here been decomposed to a soft, friable rock, the mica and feldspar being much altered. The native bismuth occurs in irregular bunches and nests throughout the quartz, or in fissures traversing the veins. These bunches vary in weight from a half-pound to fifty pounds; and the metal is particularly found associated with and incasing the crystals of smoky quartz. Sometimes it is in needles in the quartz. The walls of the segregations are charged with from thirty to fifty per cent of oxide of bismuth for a distance from the vein of from eight inches to two feet.

Mr. Robertson, from whose paper the above account is condensed, states that the entire sale of bismuth has for years been monopolized by a few London brokers, "known as the 'Bismuth ring,'—a close and conservative institution formed for the purpose of controlling the supply and price of bismuth." The present consumption of the metal is about seventy tons yearly; and it is stated that these deposits could easily produce that at a small expense. In 1882 the market-price of bismuth was 6s. 8d. per pound in London. — (*Trans. geol. soc. Glasgow*, vii. 127.) M. E. W. [554]

MINERALOGY.

Halite.—B. Wittjen and H. Precht have endeavored to find the cause of the blue color in some varieties of halite, and have arrived at the conclusion that it is dependent upon some optical phenomena, possibly connected with the presence of minute gas inclusions. — (*Berl. berichte*, xvi. 1454.) S. L. P. [555]

Rubellan.—This micaceous mineral has been investigated by M. U. Hollrung, and shown to be very various in its properties. It occurs mostly as a decomposition product of magnesian micas. It is by no means homogeneous, and cannot be classed as a distinct mineral. By means of the microscope it could be seen that crystals of the ordinary biotite form were composed of lamellae of different degrees of decomposition, showing all stages from pure mica to wholly decomposed material. — (*Min. petr. mitth.*, v. 304.) S. L. P. [556]

Parallel growth of zinc blende and tetrahedrite.—Specimens from Kapnik, Transylvania, have been studied by F. Becke. The minute crystals of tetrahedrite are deposited only upon the dull faces of the blende crystals, and are of a later growth. They have been deposited according to the following law: the principal axes of the two minerals are parallel, and the first or principal tetrahedron of tetrahedrite is parallel to the second tetrahedron of blende. The development of the tetrahedrite crystals is dependent upon their location on the blende, being most symmetrical if deposited on a dodecahedron face, and flattened if on a cubic face. A parallel growth of these two minerals has been previously noted, but with the first tetrahedron of tetrahedrite parallel to the first tetrahedron of blende. — (*Min. petr. mitth.*, v. 331.) S. L. P. [557]

Iolite (cordierite).—A. von Lasaulx has described twin crystals occurring in a cordierite gneiss from Laacher See. Twins of this species are of unusual occurrence, and have been observed with the prism ∞ P for composition face. The author finds, in addition to twins according to the old law, compound twins, part of the individuals being united according to the old law, and part according to a new law with ∞ P 3 for composition face. Twins united wholly according to the new law were not observed. — (*Zeitschr. kryst.*, viii. 76.) S. L. P. [558]

GEOGRAPHY.

(Arctic.)

Arctic land.—F. Schmidt discusses the claims of different persons, and especially Wrangell, to the discovery of land north of eastern Siberia. Discovery is hardly the proper word to apply to the record of reports by the aborigines of that region. In fact, as Professor Schmidt admits, Wrangell had his doubts as to the accuracy of the report; and his opinion was expressed, sometimes with more, sometimes with less, confidence, at different times. The first civilized man to actually see what is now called Wrangell Island was Kellett, who called it Plover Island, and made a sketch of it from a long distance away, of which I have a copy, and which is stated to be characteristic by Capt. Hooper. The high land, with extensive peaks, described by Kellett, like the Pelly Mountains of the arctic coast, described by Dease and Simpson, was simply one of those peculiar atmospheric effects which occasionally deceive the most experienced arctic travellers. The conclusion is, that no report of new arctic land is worth anything until it has at least been very closely approached. — (*Isvestia imp. geogr. soc.*, May.) W. H. D. [559]

Settlements on the Siberian coast.—Karzin gives a most valuable list of the settlements, summer fishing-stations, camps of ivory-hunters, and other places, where human beings are to be found at any season of the year on the coast of north-eastern Siberia. The chronicles of the Jeannette expedition might have been less gloomy, had the commander possessed himself of some such directory before proceeding on that unlucky voyage. — (*Isvestia imp. geogr. soc.*, May.) W. H. D. [560]

(Africa.)

Sierra Leone.—According to recent consular reports, the population of this colony comprises sixty thousand five hundred souls, nearly all blacks, who speak among them more than sixty different dialects. Freetown, the capital, has a population of twenty-two thousand, chiefly of the Aku, Ebo, Timen, Susu, Maulang, Sherbru, and Krumen tribes. The Aku and Ebo people are extremely keen traders: the three following tribes furnish middlemen, who intervene between the caravan merchants and the purchasers. The last mentioned are freighters and boatmen, employed largely in loading and discharging vessels. The trade amounts to about three million dollars annually, less than half of which are exports. The soil is poor and not arable; farming is hardly practicable; and the real importance of the colony lies in its geographical position, and easy communication with the rich interior region. Taxes and customs-duties are very high, and have injured trade by driving it elsewhere. The exports are kola, palm and peanuts, palm-oil, gum-copal, rubber, ginger, and hides. — (*Bull. soc. Belg. géogr.*, ii. 1883.) W. H. D. [561]

Portuguese Guinea.—Barros contributes a memoir on Portuguese Guinea, with notes on the customs and manners of the natives and on their language, especially of the Mandingo, Biafada, and Balanta tribes, containing little absolutely new except some songs. The article forms an interesting summary of facts. — (*Bol. soc. geog. Lisboa*, no. 12, 1882.) W. H. D. [562]

BOTANY.

Cryptogams.

The oospores of the grape-mould.—Prillieux states that he has received from M. Fréchet of Nérac germinating oospores of *Peronospora viticola*. The germinating oospores produce at once a mycelial tube similar to that known in other species of *Peronospora*, in which the germination of the oospores has been seen. This is an important step in our knowledge of the grape-mildew, since, inasmuch as the conidia produce zoospores, it had been supposed by some that the oospores would also produce zoospores, as is the case in the related genus *Cystopus*. — (*Bull. soc. botan.*) W. G. F. [563]

Swedish Algae.—Dr. C. Lagerheim describes a number of species new to Sweden, including several genera and species new to science. The species are from fresh water, as well as marine, and are illustrated by a plate. Of the genera treated most in detail may be mentioned *Merismopedium*. — (*Öfvers. svenskt. akad.*) W. G. F. [564]

Monograph of Ulvaceae.—The sixth part of Agardh's *Till algernes systematik* is devoted to the Ulvaceae. The author includes here the genera *Bangia* and *Porphyra*, as well as the green species generally placed in this order. The subject is elaborately prepared, and is illustrated by four colored plates giving the microscopic structure. *Ulva* and *Enteromorpha* are kept distinct, and *E. erecta* is credited to New York on the authority of J. Hooper.

Monostroma pulchrum the writer suspects to be a form of *M. lactuca*, a boreal species of both hemispheres. — (*Acta univ. Lund.*, xix.) W. G. F. [565]

Phanerogams.

Spines of Aurantiaceae.—Dr. Urban describes and figures specimens which show that the spines situated just above the leaf-axis of a number of members of this family, and hitherto considered as metamorphosed axillary branches, are in reality formed by the transformation of one or two of the lowest leaves belonging to the primary axillary shoot. — (*Ber. der deutschen bot. gesellsch.*, June 27.) W. T. [566]

Orchis mascula.—Mr. Malair believes that the visits of bees to this species are for propolis, which is yielded by the papillae of the nectary. Flies also visit the flowers, which are described at length, but not very clearly nor accurately. — (*Science gossip*, March, April.) W. T. [567]

Sterility of the Ficaria.—Mr. Neve notices that in England the plant seldom seeds, although its flowers appear well formed, and bees visit them. — (*Science gossip*, June.) W. T. [568]

Pollination of willow.—Mr. Hamson states, that while amentiferous plants, dependent entirely upon the wind for fertilization, have pendulous catkins, "in the willow the catkins are upright and elastic. The humble-bee is a heavy insect, and it almost invariably mounts to the summit of the catkin, which is borne down by its weight. On the bee taking flight, the catkin springs suddenly to its original position, and thus shakes out the pollen in the male, and further distributes that which may have lodged in the scales of the female catkin." Bees were noticed to confine their visits almost exclusively to the staminate plants. — (*Science gossip*, July.) W. T. [569]

ZOÖLOGY.

Protozoa.

Division of the nucleus in protozoa.—It is known that in many protozoa the number of nuclei increases with the growth of the animal; but whether the additional nuclei arise by free new formation, or by division of older nuclei, was uncertain, although Zeller had shown that the multiplication in *Opalina* was due to division. Gruber, in a valuable article, now shows that in *Actinospaerium* and *Amoeba* division of the nuclei occurs, having obtained examples after very long search. In the former the young nuclei are small, and have a single large nucleolus with a clear space around it. As the nucleus enlarges, the clear margin disappears, and the nucleolus breaks up into smaller granules (nucleoli). In one specimen various stages of division were found. Their natural succession is probably as follows: the nucleoli arrange themselves in two parallel rows across the nucleus; they then unite so as to form a homogeneous band out of each row; the rest of the nuclear substance accumulates between the two bands, which then move asunder, and meanwhile threads appear running from band to band; a line of division (partition-wall?) appears between the bands. In *Amoeba proteus* the nucleus contains a peripheral layer of

granules, and a large central mass to be regarded as the nucleolus. One specimen was found with nuclei in various stages of division. It appears that the nucleolus separates into two parts, between which, across the equator of the nucleus, appears a partition. Similar processes were observed in another *Amoeba* (sp.?). In these cases we have a form of nuclear division somewhat different from any hitherto observed; in that the nucleolus divides first, and the partition between is formed without the participation of the nuclear membrane.

Bütschli has asserted that in *Amoeba proteus* (princeps B.) the nuclei are either small and numerous, or large and few. Gruber has found them always of about the same size, and very variable in number and relative proportion to the bulk of the individual. — (*Zeitschr. wiss. zool.*, xxxviii. 372.) C. S. M. [570]

Cœlenterates.

The nervous system of the Siphonophores. — According to Korotneff, who has studied the minute anatomy and histology of the Siphonophores, the Diphyidae are the least modified, and present the most primitive or ancestral structure. In them the ectoderm is a simple muscle-epithelium with well-developed muscle-fibrillae, which lie upon *muscle-septa*, or outgrowths from the supporting layer.

A more highly differentiated organization is found in the Apolemiadae. The epithelial cells are nearly separated from the muscle-fibrillae, to which they are united only by fine protoplasmic threads. Between the muscle-septa the epithelial cells are folded over to form an 'open furrow, which is floored with cells a little larger than those over the general surface of the body.

In the Agalmidae the cells in this furrow are entirely covered up by the ordinary surface-epithelium. They are very large, are united by processes to the muscles, and they constitute a true central nervous system formed by involution of the ectoderm. The muscle-fibres of the Agalmidae are entirely separated from the epithelial cells, and the latter are flattened. Korotneff has traced the origin of the nervous system in the embryo. In a *Forskalia* larva there is no trace of nerve-cells; and the epithelio-muscular layer, the muscle-septa, and the endoderm are like the corresponding structures of Diphyes.

As the animal grows, these ectoderm-cells, which lie between the muscle-septa, grow larger, sink down, and become covered up by the ordinary surface ectoderm-cells. They then throw off processes to the muscle-fibres, and thus become converted into the nervous system. The nerve-cells are therefore, so far as their origin is concerned, epithelio-muscular cells, and they so far lend support to Kleinenberg's neuro-muscle theory.

Korotneff describes sensory cells in the region of the nervous system of the Agalmidae, and also in the air-bladder. These sensory cells are muscle-cells which still retain their primitive position on the surface; and they are furnished with sensory hairs, and are joined by processes to the muscle-fibrillae.

In the Physophora the ectoderm has been special-

ized in two ways. On the stem the cells have the morphological characteristics of nerve-cells and the position and arrangement which characterize muscle-cells: they are neuro-epithelio-muscular cells. There are also many sensory cells arranged in longitudinal rows among the ordinary cells; but there is no infolded nervous system upon the stem, as there is in the Agalmidae. This is to be found, however, upon the air-bladder, which is thickly covered with nerve-cells. On the upper surface of the bladder these are directly united to the surface-epithelium, while upon the lower surface they are directly united to the muscles. He says that there are physiological reasons (which are not stated) for believing that the upper nerve-cells are sensory, and those on the lower surface motor.

He speaks very briefly of the diffused nervous system of *Porpita*; and his observations apparently agree with those recently published more at length (see SCIENCE, ii. 396) by Conn and Beyer. — (*Zool. anz.*, 148.) W. K. B. [571]

Worms.

Systematic papers on worms. — Dr. R. v. Drasche has taken advantage of the preservation of all Diesing's and many of Molin's original specimens of nematods in the Vienna museum to draw up fresh and more accurate diagnoses of the species described by these authors, and also to give a good many new figures. This labor is calculated to avoid much confusion which might otherwise arise from the very imperfect character of the original descriptions. — (*Verh. zool-bot. ges. Wien*, xxxii. 117.)

The same author also describes some new ascarids collected in Brazil by Natterer, and adds some notes on *Ascaris ovis* and *A. rigida*. — (*Idem*, 139.)

G. M. R. Levensen has published the first part of a valuable revision of northern Annulata, Gephyrea, Chaetognathi, and Balanoglossi. He attempts chiefly to describe the species, elucidate their history in scientific writings, and their geographical distribution. The essay contains full synoptic tables. The work was undertaken at the request of Prof. Steenstrup and Dr. Lütken. — (*Vidensk. meddel. naturh. foren. Kjöbenhavn*, 1882, 160.) C. S. M. [572]

Pentastomum from an Alligator lucius. — J. Chatin has found *Pentastomum*, probably *P. oxycephalum*, in the liver of a caiman. This is a new locality for the parasite. He gives an excessively prolix general account of the anatomy of the animal, but contributes little that is new. The hooklets around the mouth have a stalk, and three movable claws thereon, — two at the sides near the end, the third terminal. The author denies the cellular character of the epidermis: it is 'formed merely by a mass of protoplasm in which are scattered numerous nuclei.' (It can hardly be questioned that this is a mistake due to superficial observation. The author gravely adds his doubts as to the cellular constitution of the epidermis in arthropods generally. In this he is singularly unfortunate; as there is hardly any fact in insect histology more easily verified, even by inexperienced students, than the existence of epidermal — so-called hypodermal — cells. The error of describing an epi-

thelium as a sheet of protoplasm with scattered nuclei has been committed over and over again by persons not trained in histology.) The description of the course of the nerves rectifies previous accounts. — (*Ann. sc. nat. zööl.*, xiv. art. 2.) C. S. M. [573]

Crustaceans.

Isopoda of the Blake dredgings. — In a report on the Isopoda dredged on the east coast of the United States in 1880, by the U. S. coast-survey steamer Blake, under the direction of Alexander Agassiz, Oscar Harger says that the collection, although small, is remarkable for the large proportion of interesting forms; since nearly all the species are either new, or not hitherto known upon our coast, or known only from single specimens. Nine species, all belonging to Cirolanidae and Aegidae, are enumerated, and most of them fully described and figured on four excellent photo-lithographic plates from the author's drawings. — (*Bull. mus. comp. zööl.*, xi., no. 4, Sept., 1883.) S. I. S. [574]

Development of Panopeus. — E. A. Birge describes and figures the post-embryonal and some of the later embryonal stages of *Panopeus Sayi* and the second zoea stage of *P. depressus*. He describes four distinct zoea stages after the casting of the embryonic cuticle (or 'larval skin,' as Prof. Birge calls it) and a 'first megalops stage,' and discusses the metamorphoses undergone by the body and appendages in the change from each stage to the next. After describing the 'first megalops stage,' Prof. Birge says, "Subsequent changes in the megalops affect the proportions of the carapax, which becomes broader proportionally, and that of the abdomen, which becomes smaller, and is permanently flexed under the sternum. The appendages undergo many changes, gradually approximating them to the adult form. The last stage is reached after several — at least four — moultings." Unfortunately none of these remarkable later megalops stages are described or figured, as they certainly deserve to be if actually observed. During several seasons' observations the writer has found no evidence of more than one megalops stage in this or allied species; and, with the exception of Bate's doubtful observations on *Carcinus*, there are apparently no well authenticated cases of several megalops stages in any species of *Brachyura*. The numerous figures illustrating the paper are rude and inaccurate. — (*Stud. biol. lab. Johns Hopk. univ.*, ii., no. 4, July, 1883.) S. I. S. [575]

Insects.

Sucking-apparatus in butterflies. — P. Kirbach describes the structure of the maxillae and pharynx in the *Lepidoptera* precisely as described by Burgess in the *American naturalist* for May, 1880, and more at length in a memoir on the anatomy of the milkweed butterfly in the *Anniv. memoirs Bost. soc. nat. hist.*, 1881. Kirbach makes no reference to either of these papers, though both were recorded in the very journal containing his article, as well as in Carus's *Zool. jahresbericht* by Bertkau, in the *Arch. f. naturgesch.*, and in the *Zoölogical record*. However, it is satisfactory to have observations independently con-

firmed; and Kirbach gives almost a verbal and pictorial repetition of the above-quoted papers. Thus the suspensory muscles of the pharynx receive the identical names given them by Burgess. Kirbach believes the proboscis is extended by muscular contraction, and rolled up by elasticity, but gives no proof of his view. This is the opposite of what the muscular arrangement seemed to Burgess to indicate; although he added that "it is more probable we fail to see, or to correctly interpret, some proper muscular mechanism for both movements of the proboscis." Unfortunately, Kirbach does not help us here.

Kirbach describes, for the first time, the syringe-like mechanism of the salivary duct, by which saliva is injected into the proboscis. This arrangement was overlooked by Burgess. — (*Zool. anz.*, vi. 553.) E. B. [576]

Wheat-stem maggot or bulb-worm. — The larva of *Meromyza americana* Fitch has been very destructive this year to wheat and rye in Fulton county, Ill. Important additions to the published observations of Fitch, Riley, and Lintner, have been made by S. A. Forbes, who gives descriptions and figures of all stages of this insect. The egg is now figured for the first time, and a winter brood has been observed. — (*Prairie farmer*, Aug. 4.) J. H. C. [577]

VERTEBRATES.

Histology of the nervous centres. — C. Golgi has investigated the morphology of ganglion-cells. His conclusions are in some respects very different from those of previous investigators, and, if confirmed, will mark an important advance in our knowledge of the subject. On this account we give a longer abstract than usual for special papers.

The origin of the nervous fibres depends on certain constant laws, uniform for the different centres, despite certain secondary differences in the morphology and distribution of the histological elements. The ganglion-cells may in general be distinguished from the other cells by their form, the appearance of their nuclei, and the mode of origin of their prolongations; but they are especially characterized by the presence of the *single nervous* (Deiter's) process, which *alone* enters into connection with the nerve-fibres to make part of, or constitute them. The protoplasmatic processes have nothing to do with the origin of the nerve-fibres, directly or indirectly: they are in relation with the connective-tissue corpuscles (exactly how is not shown, so this may be questioned). As each cell has only one Deiter's process, it follows that they are all really unipolar. The sensory and motor cells cannot be distinguished definitely by their form or size from one another; but, as regards Deiter's process, two forms are distinguished, — the first is supposed to go with the motor cells, the second with the sensory. The established view that the process is continued without branching into the axis-cylinder is discarded; for Golgi maintains that it gives off a more or less considerable number of filaments on its way. In the first form, the process, although giving off filaments, still maintains its individuality, and can be followed to the points where it enters the

medullary sheath as the axis-cylinder. Corresponding nerve-fibres are found, which preserve their individuality, notwithstanding the filaments they give off from the axis-cylinder, which can be followed to the ganglion-cells. The structures are supposed to belong to the sensory system. In the motor system the individuality of the process or of the fibre is lost in the gray substance, completely breaking up into filaments which enter into the formation of a diffuse network. It would appear, then, that the motor process breaks up into filaments, forming a network, from which spring the other filaments, which unite to form the motor axis-cylinder. The network really receives filaments also from the sensory process and fibres; so that it may be regarded as a fundamental nervous plexus, both sensory and motor, by means of which each fibre communicates, not with a single cell, but with large groups. The tendency is towards extended, not restricted, communications; and there is no anatomical basis for the assumption of the isolated transmission of peripheral nervous impulses to hypothetical limited cellular individualities. This investigation, therefore, lends no support to the theory of cerebral localization. Deiter's process is characterized from its origin by its greater homogeneity, its hyaline aspect and smooth surface, while the protoplasmatic processes are granular.

Golgi has also studied the histology of the *cortex cerebri*, especially to compare the anterior with the occipital convolutions. Meynert's plates, and division of the cortex into five layers, he thinks, do not agree with the reality. Golgi distinguishes three forms of ganglion-cells, — pyramidal, fusiform, and globular (or polygonal with rounded angles). He distinguishes three layers of about equal thickness. The superficial layer is formed almost exclusively by rather small pyramidal cells; the middle layer has, for the most part, larger pyramidal cells; while in the deep layer the fusiform cells prevail, and the globular cells, which occur throughout the cortex, are here most abundant. The largest pyramidal cells extend through the whole thickness of the cortex. Such is the organization of the *gyrus centralis anterior (frontalis ascendens)*. The organization of the superior occipital convolution is similar, except that the deep layer contains the globular cells almost exclusively. There are no anatomical features to indicate that the anterior convolutions are motor, the occipital sensory, as Hitzig and others have maintained. "The specific functions of the different cerebral zones do not depend on the organization of these zones themselves, but on the specific character of the peripheral organs which are connected with the fibres entering or leaving the zones in question." — (*Arch. ital. biol.* iii. 285.) C. S. M. [578]

Birds.

Development of the heart. — Assaky maintains, 1°, that the heart arises in the chick as a double tube, as may be seen before the differentiation of the third protovertebra; 2°, the myocardium is constituted from the first by a network of anastomosing cells; the muscular fibres arise by endocellular generation;

3°, the muscle-cells are derived from amoeboid cells [i.e., are mesenchymal]. — (*Comptes rendus*, xcvi. 183.) C. S. M. [579]

Plumages of the stone-chat. — Messrs. Butler, Fielding, and Reid seem finally to have solved the variations in plumage of this interesting bird. According to them, there are nine different stages easily recognizable. We note with satisfaction that the theory of hybridization seems to be done away with. — (*Ibis*, 1883, 331.) J. A. J. [580]

Mammals.

The influence of quinine upon heat-dissipation and heat-production. — In a late article by Wood and Reichert (*Journ. of physiol.*, iii. 321), the authors make the statement that quinine increases both heat-production and heat-dissipation, though, on the average, the percentage of increase of heat-dissipation largely exceeds that of heat-production. A desire to test the accuracy of these results has led Arntz to make a similar series of experiments. To measure the relative amount of heat-dissipation from the skin, he made use of a porous wooden cap, lined with felt, which could be applied to any part of the body. The temperature within the space thus enclosed was registered by a delicate thermometer. Any increase in the loss of heat through the skin would be shown, therefore, by the thermometer. Experiments were made upon men and rabbits in a normal healthy condition, the general results of which show that no increase in heat-dissipation follows the injection of quinine. To explain the contradiction existing between his own and Wood's results, he supposes that the doses used by the latter were too large for the animal (dog) experimented upon; and the increase in heat-dissipation was probably owing to the animal's struggles and attempts to vomit. Two experiments that he made upon dogs, using the same dose as that given by Wood, tend to support this explanation. To determine the effect of quinine upon heat-production, spirometric observations were made upon normal rabbits, and rabbits suffering from septic fever, the amount of oxygen absorbed being taken as an indication of the oxidations going on in the body. In normal rabbits, quinine was found to have no effect upon the amount of oxygen consumed; while, in febrile animals, it caused a diminution in the oxygen-consumption. The author's conclusion, with regard to the anti-pyretic action of quinine, is, that it acts in the first place indirectly by destroying the organisms which give rise to the fever, and, in the second place, directly diminishes the oxidations in the tissues of the body. — (*Pflüger's archiv*, xxxi. 531.) W. H. H. [581]

Action of carbon dioxide and oxygen upon the mammalian heart. — The present paper by Klug forms an extension of some previous work of the same nature on the frog's heart. His experiments were made upon dogs anaesthetized by means of morphia, and made to breathe in an atmosphere containing different percentages of carbon dioxide or oxygen. With regard to the action of carbon dioxide he finds, in accordance with previous observers, that it acts as

a stimulus to the vaso-motor and cardio-inhibitory centres of the medulla; but, in opposition to the statements of Traube and Landois, he asserts that it disables the intrinsic motor centres of the heart. He grounds this statement on the fact, that, after section of the vagi and the cervical cord, the heart soon ceases to beat, when the animal breathes in an atmosphere containing from twenty to forty per cent of carbon dioxide. Breathing in an atmosphere of oxygen stimulates both the inhibitory and accelerator centres of the medulla: and the author repeats for the mammal a statement made with reference to the frog; viz., that oxygen acts as a constant stimulus for the heart-contractions. Want of oxygen, like carbon dioxide, stimulates the inhibitory and vaso-motor centres, and first stimulates, then depresses, the accelerator centres. — (*Arch. anat. physiol.*, 1883, 134.) W. H. H. [582]

Maturation and impregnation of the mammalian ovum.—G. Rein has investigated these phenomena in rabbits and guinea-pigs. He describes minutely his manner of obtaining the desired material. In rabbits the tuba can be cut open, and examined with a lens: in guinea-pigs it is better to collect the eggs by pressing out the excised tuba with a blunt instrument. They may be examined fresh in the fluid from the oviduct, and even kept so for some time, if the cover-glass is surrounded by a rim of oil, and the slide placed in a warm box. To preserve the eggs, fix with (.1%–1%) osmic acid, place them for two or three days in Müller's fluid, and mount in glycerine.

The so-called corona radiata consists of the cells (changed to the spindle form) of the discus proligerus. It is most marked in the rabbit immediately before the bursting of the Graafian follicle, i.e., nine to eleven hours after copulation; by which time one polar globule has generally been formed. The cells of the corona present features most unusual in epithelia: they are elongated, spindle or star shaped, with processes which branch often and anastomose with one another; they are probably forced apart by the liquor folliculi, which accumulates, especially during the last hours before the bursting of the follicle; after that event they resume their original form. As the ovum matures, the nucleus is distended, and assumes an eccentric position and oval form. The nucleolus is replaced now by a cluster of granules, which then scatter themselves through the yolk, become smaller and ultimately indistinguishable. The nucleus comes to lie close against the zona pellucida, and there is flattened out. The next change is the expulsion of the first polar globule, which appears to be formed out of the germ-vesicle. No karyokinetic figures were observed in connection with the process. Rein suggests that possibly the mammalian polar globules are not complete homologues of those of the lower animals. The maturation is further marked by the contraction of the yolk, first, at the point where the polar globule is ejected; second, general, so that the yolk recedes, as in other mammalia, from the zona pellucida. In three cases active protuberances on the yolk were observed (cf. Kupffer, ante, i. 1132). In the mature ovum also

appear yolk-grains larger and much darker than the other granules. In four cases a second nucleus was observed more in the centre of the egg, probably the egg-nucleus (or female pronucleus).

Impregnation takes place in the middle third of the tuba thirteen to seventeen hours after copulation. Two pronuclei (male and female) are seen in the ovum: they travel towards one another, meet eccentrically, make amoeboid movements, and sometimes are quite near the surface. The radiating lines could not be seen in most cases around the pronuclei. At the time of impregnation the cells of the corona have partly fallen off. Numerous spermatozoa crowd around the egg, several pass the zona; but probably only one enters the yolk. The pronuclei pass to the centre of the ovum, the amoeboid movements continue; one pronucleus becomes crescent-shaped, and embraces the other: the two then probably unite. — (*Arch. mikros. anat.*, xxii. 233.) C. S. M. [583]

Duration of systole and diastole of heart-beat.—From a series of experiments made upon the dog, Howell and Ely have come to the conclusion that variations of arterial pressure from fifty millimetres to a hundred and sixty millimetres of mercury have no direct effect whatever upon the duration of either systole or diastole. The experiments were carried out upon hearts completely isolated from every other organ of the body, except the lungs, after the method devised by Prof. Martin. The contractions of the heart were registered by means of a Pick spring manometer connected with the cavity of the right ventricle, and the time relations of the beat were determined by comparing this curve with the simultaneous tracing of a tuning-fork vibrating fifty times a second. — (*Stud. biol. lab. Johns Hopk. univ.*, ii. 453.) W. H. H. [584]

ANTHROPOLOGY.

Tattooing among civilized people.—Last December Dr. Robert Fletcher read a paper on tattooing among civilized people, which he is now publishing. The custom presents itself from two points of view, — the medico-legal and the anthropological. Compared with the elaborate tattooing of many savage tribes, the designs which sailors, soldiers, and, above all, criminals, have imprinted on their persons, are trivial or offensive in subject, or clumsy in execution. In 1869 Berchou made several reports to the French government on tattooing among sailors and criminals, and published a work entitled '*Histoire médicale du tatouage.*' At the meeting in Algiers in 1881, of the French association for the advancement of science, Magitot exhibited a chart showing the geographical distribution of tattooing, according to methods, as follows: 1. By pricking; 2. By simple incision; 3. By ulceration or burning; 4. Hypodermic tattooing; 5. Mixed tattooing. Among the distinguished observers of this practice are Cesar Lombroso of Turin, and Dr. A. Lacassagne of Lyons. Lombroso publishes a chapter on tattooing in his '*L'uomo delinquente,*' and Lacassagne is the author of a volume entitled '*Les tatouages, étude anthropologique et médico-légale.*' He gives a table showing the parts of the body oper-

ated upon in 378 subjects, and also one containing the details of 1,333 tracings obtained from the battalion d'Afrique, as follows:—

Patriotic and religious emblems . . .	91
Professional emblems	98
Inscriptions	111
Military emblems	149
Metaphorical emblems	260
Amorous and erotic emblems	280
Fantastic, historical, and miscellaneous, 344	

1,333

The reader will find this one of the most entertaining and instructive anthropological papers which have appeared in a long time. — (*Trans. anthrop. soc. Washington*, ii. 40.) J. W. P. [585]

The Mexican pulque.—“One of the first objects to claim the attention of the conquerors of Mexico,” says Carl Beni, “was the maguey-plant (*Agave americana*; Mexican, *neutli*). Its manifold uses and products, considered in relation to the inhabitants of that region and to their manner of living, render interesting the study of this vegetable, which is justly called *pianta delle meraviglie*.” De Candolle thinks that the plant is of Mexican origin; but the place where it was discovered to furnish a beverage is uncertain, for traditions concerning it are intimately connected with the history of the ancient peoples who occupied the central plateaus of South America. According to the Mexican traditions, Ixquitecatl was the first to invent the method of drawing the sweet juice from the maguey, and Titlacahuan used pulque to intoxicate Quetzalcoatl and to induce him to go into exile. Another legend says, that in 1045 the juice of the plant was introduced as a drink among the royal family. Signor Beni has collected from various sources the references to the uses of this celebrated

plant, and in 1876, while in Mexico, made some observations on its cultivation and uses. The following is the analysis of the sap and of the fermented liquor:—

	Sap.	Pulque.
Albuminous substances	25.40	12.57
Sugar	95.53	8.23
Salts	7.26	2.20
Absolute alcohol	0.00	36.80
Water, gas, and waste	871.81	940.20
	1000.00	1000.00

— (*Archiv. per l'antrop.*, xiii. 13.) J. W. P. [586]

The use of mollusks.—Dr. A. T. de Rochebrune has written a second memoir upon mollusks among ancient and modern peoples, this time treating of shells in the sepulchres of Ecuador and New Granada. The mounds of the United States furnish some beautiful specimens of aboriginal art in shell, and our archeologists have not been slow in taking advantage of the interest clustering about these objects. The relative rarity of mollusks utilized by the ancient inhabitants of the Peruvian coast is noticed by M. Rochebrune. The farther north we go, the more pronounced this poverty becomes. Indeed, the following five species are all that the author has found from that region:—

1. *Spondylus limbatus* Sow, statuettes and necklaces.
2. *Venus multicostata* Sow, spangles, necklaces.
3. *Patella olla* Brod., bangles, quippus(?) beads.
4. *Oliva splendidula* Sow, bangles, pendants.
5. *Fasciolaria salmo* Wood, pieces for clothing.

Two or three of the objects are carved with some elaborateness of design. — (*Rev. d'ethnog.*, ii. 311.) J. W. P. [587]

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Geological survey.

Comparative paleontology of the Devonian formation.—Prof. H. S. Williams has recently been devoting his attention especially to this formation in western New York, and, in a preliminary report to the director, makes known some interesting facts as a result of his study of the materials collected by him during the past summer.

In the black shales, which in New York lie between beds containing Hamilton faunas below and those bearing Portage faunas above, he has found *Lingulas* indistinguishable from those of the Cleveland shales; also conodont teeth identical in form with those described from the same Cleveland beds, and *Sporangites* and *Palaeoniscus* scales. Species, therefore, regarded by Ohio geologists as characteristic of the Cleveland shales (Waverly), occur together in a similar black shale in New York, which there is known to underlie the upper Devonian. Professor Williams says, how-

ever, that, although the identity of the two faunas can scarcely be disputed, he is not so sure that it is an indication of synchronous deposition. The various black shales of Ohio are more nearly continuous there than in New York; and he says it is pretty clear that the intercalated sandy deposits are of a more eastern origin. At the horizon of upper Devonian the sands are purer and of lighter color as we go westward and south-westward; and in some of the quarries of western New York, sandstones very similar to the Ohio Waverly stone are met with. In these sands distinct quartz pebbles have been found, nearly as low as the point where the first member of the typical Chemung fauna is obtained, leading Professor Williams to suspect that true conglomerates may, in some geographical area, have been contemporaneous with the early Chemung fauna. He says the evidences are accumulating in support of the hypothesis that the lower conglomerates are the geographical representatives of deposits of much finer character farther north, in which the Chemung faunas appear. He meets the