however, are statements which ought to be changed in a second edition. The Zygnemae are erroneously described as producing zoospores (p. 5), — a statement true enough of their relatives the Confervae, but not of any of the Zygnemae. Of roots it is said positively (in italics, p. 29) that 'they are never green,' which, to say the least, is a strong statement. On p. 34 we find that "in some plants the calyx or corolla is entirely wanting, in which case the floral covering is called the *perianth*," which is certainly not in accordance with ordinary usage. On the same page the stigma is curiously described as 'the surface of the style.' The Equiseta are not leafless, as they are said to be on p. 164. Their leaves are small, it is true; but certainly the whorls of united leaves at each joint are evident enough to even the casual observer. The formation of the zygospore in Mucor is not correctly given on p. 184, where it is described as resulting from the union of two aerial hyphae. On p. 192, in describing the fly fungus, the reader is given the impression that a mycelium upon a surface (as a window-pane) attacks its hapless victim, the fly, which, when dead, is said to be "standing upon a mat of delicate silk threads spread upon the glass."

Fig. 21 (repeated in fig. 143) is erroneous in showing the hyphae of the potato fungus to be septated. Fig. 104 is said to show the antheridia of a moss; but certainly no such organs are visible in the cut given.

In spite of the slips noted above, and others which we may well pass over, the little book is a pleasant one to read, and we feel sure that it will receive a hearty welcome from plant-lovers everywhere.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Saturn's rings. — Encke's division in the outer ring of Saturn has been examined by M. Schiaparelli, who finds that the position and lack of symmetry are the same as previously noticed, but the line is broader, and more diffused than in 1881. He thinks the phenomenon is variable, and accounts for it by supposing the middle of the ring to be thinner, and by the change of orbit of the particles composing it. He also examined carefully the region about the inner bright ring and the dark ring. At times O. Struve's division was seen very distinctly, and on other occasions very faintly. More observations are necessary to determine whether the phenomenon is variable. — (*Observ.*, Aug.; *Astr. nachr.*, 2,521.) M. MCN. [289

The great comet of 1882. — Mr. Maxwell Hall shows the possible identity of the great comet of 1882, the comets of 1880, 1843, and 1668, with a comet which appeared B.C. 370, and which was said to have separated into two parts. The orbits of all are nearly identical. Taking a period not greatly different from that given by Prof. Frisby for the comet of 1882, he identifies the comets of B.C. 370 and A.D. 1843 with one which was seen in 1106. No comet is recorded for A.D. 368. The comets of 1880 and 1882 may possibly be identical with two which appeared in 1131 and 1132, and with the second part of the comet of B.C. 370. If this is the case, this comet also probably separated into two parts at its unrecorded appearance in A.D. 381 or 382. We already have an instance of this separation in Biela's comet; and the comet of 1882 gave evidence, to a certain extent, that a process of disintegration was going on. — (*Observ.*, Aug.) M. MCN. [290

PHYSICS.

Electricity.

Atmospheric electricity. — Dr. L. J. Blake has found that no convection of electricity takes place by the rising vapor from a charged liquid surface, to which he gave a potential due to from four to five hundred Daniells cells. The plate placed in the track of the vapors was, in the different experiments, either colder than the vapor, or of the same temperature. By connecting the liquid with the electrometer, he finds a small negative charge, increasing during the fifteen minutes which each experiment lasted, but not sufficiently to justify the statement that electricity is generated by evaporation. In all the work, the lamp was removed before connecting with the electrometer; and the whole apparatus was within a metallic covering connected with the earth. Distilled water, sea-water from the North Sea, alcohol, dilute sulphuric acid, mercury, and solutions of a number of different salts, were tried. — (*Ann. phys. chem.*, xix. 518.) [291

ENGINEERING.

A new current-meter. — Mr. L. d'Auria proposes an apparatus for determining the mean velocity at any vertical in a stream, which apparatus consists of a scow, or pontoon, to be moored in the desired place; a pole with a pulley near each end, carrying an endless cord; a light ball; and a species of net, or grillage. The pole is thrust to the bottom alongside the scow, at the point where the velocity is to be gauged; and the ball is lightly attached to the cord by a string, so as to be disengaged by a moderate pull when it reaches the pulley at the bottom. The time of the disengaging pull is noted, and also the time of the appearance of the ball at the surface. As the

floating grillage has previously been moored over this place, the ball is caught at the point of rising, and the horizontal distance of this point from the pole measured. Hence are known, upon measuring the depth, the two co-ordinates of the point at the surface from the bottom of the pole. The author proposes to weight the ball until it shall be one-half the heaviness of water. He deduces some equations to prove that the ball rises with a practically uniform velocity, and observes, that for a depth of 30 feet, from which such a ball would rise in about 11 seconds, and a mean velocity of current of 4 feet per second, the ball would travel horizontally about 44 feet.—(*Amer. eng.*, Aug. 24.) C. E. G. [292

CHEMISTRY.

(*Physical.*)

Determination of vapor density.—Br. Pawlewsky proposes a modification of Dumas' method in which he uses a globe of 20–30 cubic centimetres volume. After heating, the globe is closed by a rubber cap, which is fitted to a cylindrical tube of glass sealed at one end. The volume is therefore constant for different determinations, and the observations may be taken in a room of nearly constant temperature. In the formula of Dumas,—

$$m = \frac{0.0012932 \,.\, V \,.\, B_0}{(1 + a\,t)\,760}, \qquad \text{(I.)}$$

where m is equal to the weight of air, the product $0.0012932 \,.\, V = K$ would be constant. The value $(1 + a\,t) = N$ is constant, and may be obtained from a table. If, then, the constant, K, is divided by 760, a new constant, D, results, and (I.) becomes

$$m = \frac{K \,.\, B_0}{N \,.\, 760} = \frac{D \,.\, B_0}{N}. \qquad \text{(II.)}$$

In a determination at any temperature, t'_0, and any pressure, B'_0, if the weight of air in the apparatus is represented by n, its weight is shown in the formula

$$n = \frac{0.0012932\ V\ (1 + \kappa t')\ B'_0}{(1 + a\,t)\,760}, \qquad \text{(III.)}$$

in which κ represents the coefficient of expansion of the apparatus. If the temperature is constant, and the same apparatus is used in different determinations, the product $0.0012932\ V\ (1 + \kappa\, t')$, and the whole denominator, become constant. Representing the denominator by R, and the product $0.0012932\ V\ (1 + \kappa\, t')$ by M, the fraction $\frac{M}{R} = C$ is constant, and formula (III.) will take the form

$$n = \frac{M B'_0}{R} = C \,.\, B'_0. \qquad \text{(IV.)}$$

The volume of air may therefore be obtained by multiplying the constant, C, by B' reduced to B'_0; and when the weight, a, of the vapor, and that of the air, n, under the same conditions, are known, the vapor density may be found by the formula

$$D = \frac{a}{n}. \qquad \text{(V.)}$$

The apparatus may be heated in a beaker of medium size, containing water, oil, or paraffine. For a complete description of the apparatus, reference must be made to the original article. A series of determinations are given, which indicate a high degree of accuracy.—(*Berichte deutsch. chem. gesellsch.*, xvi. 1293.) C. F. M. [293

GEOLOGY.

Evidences of modern geological changes in Alaska.—Mr. T. Meehan exhibited a piece of wood taken from a prostrate tree which had been covered with glacial drift on a peninsula of Hood's Bay, Alaska, formed by the junction of Glacier Bay and Lynn Channel. The trunk, which lay under a block of granite estimated to measure 2,214 cubic feet, was quite sound, and exhibited no evidence of great age since it became covered. The shores are strewn with rocks and stones of various kinds, as usual in cases of glacial deposits. All the surroundings indicated that there had been a sudden subsidence of the land, accompanied by a flow of water with icebergs and huge bowlders, which crushed and tore off the trees. The whole surface was afterwards covered to a great depth with drift. Since that time, there must have been an elevation of the land bringing the remains of trees to their original surface, but with a deep deposit above them. A study of the existing vegetation might afford an approximation to the time when these events occurred. The living forest indicated clearly that it could not have been, at the farthest, more than a few hundred years since the elevation occurred. The trees in the immediate vicinity, indeed, were not more than fifty years old; but unless the original parent trees, which furnished the seed for the uplifted land, were near by, it might take some years for the seed to scatter from bearing trees, grow to maturity, again seed, and, in this way, be spread to where we now find them. But, as original forests were evidently not far distant, two or three hundred years ought to cover all the time required. The Indians of the region have a tradition of a terrible flood about seven or eight generations ago, from which only a few of the natives had escaped in a large canoe. The probable identity of the sunken trees with the present species, and the freshness of the wood, indicate no very great date backwards at which the original subsidence occurred.

In connection with the subject of the comparatively recent occurrence of great geological changes, as indicated by botanical evidence, Mr. Meehan referred to an exposure of the remains of a large forest near the Muir glacier,—one of five huge ice-fields which form the head of Glacier Bay between Lat. 59° and 60°. This glacier is at least two miles wide at the mouth, and has an average depth of ice, at this spot, of perhaps five hundred feet. At the present time there is not a vestige of arboreal vegetation to be seen in the neighborhood. The river which flows under the glacier rushes out in a mighty torrent a few miles above the mouth, and has cut its way through mountains of drift, the gorge being many hundred feet in width, and the sides from two hundred to five hundred feet high. The torrent, though the bed is now comparatively level, carries with it an immense quantity of heavy stones, some of which must

have contained six or eight cubic feet. Along the sides of this gorge were the exposed trunks referred to, all standing perfectly erect, and cut off at about the same level. Some were but a few feet high, and others as much as fifteen, the difference arising from the slope of the ground on which the trees grew. The trunks were of mature trees in the main, and were evidently Abies Sitkensis, with a few of either Thuja gigantea or Juniperus, perhaps J. occidentalis. These trees must have been filled in tightly by drift to a height of fifteen feet before being cut off: otherwise the trunks now standing would have been split down on the side opposite to that which received the blow. The facts seemed to indicate that the many feet of drift which had buried part of the trees in the first instance were the work of a single season, and that the subsequent total destruction of every vestige of these great forests was the work of another one, soon following. As in the case of the facts noted in Hood's Bay, the conclusion was justified, that the total destruction of the forests, the covering of their site by hundreds of feet of drift, and the subsequent exposal of their remains, were all the work of a few hundred years. — (*Acad. nat. sc. Philad.; meeting* Aug. 28.) [294

MINERALOGY.

Stibnite from Japan. — Within the last few months most remarkable specimens of stibnite from Mount Kosang, in southern Japan, have been received in America. For great size and beauty, as well as complexity of form, they rival all specimens of the same species from other localities, while the crystals have arrived at a degree of perfection rarely met with in metallic minerals. The crystals have been carefully studied and fully described by E. S. Dana. Their great complexity of form is of the highest scientific interest. There had previously been identified on stibnite forty-five crystal planes. Of these, thirty have been observed on the Japanese crystals, and, in addition, forty new ones. The habit of the crystals is quite constant, being prismatic, elongated in the direction of the vertical axis, single crystals obtaining often a length of over twenty inches and a width of two inches. The prismatic planes are deeply striated. The crystals are usually terminated by a few polished pyramidal faces. They are usually quite simple in form; very complicated, large crystals occurring only occasionally, while the more complicated ones are usually small. The planes in the zone between the brachypinacoid (010) and unit macrodome (101) are those which ordinarily terminate the crystal. Another remarkable zone is between the brachypinacoid (010) and macrodome (203), consisting of ten planes, all but one of which are new, and as many as nine of which have been observed on a single crystal. A bending in the direction of the macrodiagonal axis is a feature of the crystals, and seems to be characteristic of the species. In the Japanese crystals this bending seems to be confined to the termination. A corkscrew-like twist has been observed in slender crystals. The lustre of the crystals is very remarkable, and is to be compared to highly polished steel, while the perfect brachypinacoidal cleavage yields a cleavage-surface of remarkable beauty. — (*Amer. journ. sc.*, Sept., 1883.) S. L. P. [295

GEOGRAPHY.

(*Asia.*)

Railways in the Caspian region. — General Chernaieff, the governor of Turkestan, has recently gone over the route from Kungrad to the Caspian in person, and finds it well suited for vehicles. Even a railway between the delta of the Oxus and the Gulf Mertvi-kuttuk has been talked of. The connection of Tiflis and Baku by rail is completed, and the journey can now be made between the Black and Caspian seas in thirty hours without change. — (*Comptes rendus soc. géogr.*, June.) W. H. D. [296

Prjevalski's travels. — This indefatigable explorer has just started for Kiachta, on the Siberian border of China, in order to continue his researches in central Asia. On this occasion he will endeavor to penetrate the north-west part of Thibet, without giving up his original idea of reaching Lassa, or at least as far as Batang or Tziamdo. He will have a well-armed escort of some twenty men, fully equipped for two years' service. The publication of the third volume of his travels has just been finished. During these he has travelled 23,530 kilometres; topographically sketched over 12,000 kilometres along his line of travel, in countries previously quite unknown; determined the altitude of 212 points, and the latitude of 48 localities; and has collected ten or twelve thousand specimens of animals and plants belonging to over two thousand species. — (*Comptes rendus soc. géogr.*, June.) W. H. D. [297

(*Africa.*)

Notes. — C. Doelter has ascended the Rio Grande as far as Futa Djallun, but was prevented from going farther east by a war among the natives. He believes that the Rio Grande has been incorrectly mapped, and doubts its alleged identity with the Tomani River. —— The English have annexed the Guinea coast from the right bank of the Mannah River toward the Liberian boundary-line, — a distance of eight leagues in a north-westerly direction; and the Portuguese government has ceded to England the fort of St. John de Ajuda, situated on the Dahomey coast. Ajuda, or Whydah, is situated a short distance from the coast, on a shallow lagoon. The port is a poor one, like all those on the Guinea coast; and there are very few white residents. It is said that the cession was contingent on the recognition, by England, of the acquired rights of Portugal on the Congo. —— Robert Flegel, during the past season, has discovered the source of the Binué, an affluent from the east of the lower Niger, and also of the Logué, which discharges into Lake Chad. In this way he has been able to trace the watershed between the two basins, through a previously unexplored district. —— Hore has arrived at Ujiji on Lake Tanganyika, and proposes to establish a regular postal service on the lake, between the missionary and other stations. —— Dr. Baxter has attempted an exploration of the country of the Massai adjacent to Mpuapua.

These people are extremely hostile to strangers, and his success, therefore, is problematical. —— The Mahdi, or false prophet, who has been menacing Khartum, is reported to have captured the traveller, G. Roth, who was sent out by the Geographical society of St. Gall, Switzerland, to explore the upper Nile. —— Yunker has succeeded in passing from the basin of the Nile to that of the Congo, and continues his explorations, while one of his party has returned with the collections made in the Niam-Niam country. —— Paul Soleillet writes from Ankober of his safe arrival at Shoa, the success of his journey, and his favorable reception by King Menelik II., who governs all the population of Obok Shaffa and adjacent region with a firm rule. Menelik is favorable to trade with foreigners; and it is announced that he has been named by King John of Abyssinia as his successor, in default of direct heirs, to that kingdom. Soleillet has formed valuable collections, and has discovered wild coffee forming a dense undergrowth in the forest along the river Guébé, and indefinitely beyond. He reports the product of the wild plant to be of excellent quality. —— The abbé Trihidez, almoner of the army of occupation in Tunis, is reported to have discovered at Susa some Phoenician stelae engraved in a rather artistic manner, and in a good state of preservation. These records have been pronounced to be of great interest by such eminent specialists as Renan and Berger. —— M. Alphonse Aubry has forwarded to the Ministry of public instruction at Paris, reports on the geology of the English colony of Aden, which is situated in the horseshoe-shaped crater of an extinct volcano, and on the French colony of Obok on the opposite shore of the Gulf of Aden. —— Gold has been found on the Kaap River in the Transvaal. Nuggets of half a pound in weight are reported. —— Oil has been 'struck' in Natal, near Dundee, and also large deposits of magnetic iron. A company has been formed at Pietermaritzberg to investigate these minerals. — W. H. D. [298

BOTANY.

Thermotropism. — Julius Wortmann has recently shown that radiant heat falling upon a growing organ can cause curvatures either toward or away from the source of energy, and that the phenomena are in general much like those produced by light. His experiments are interesting, but are, as yet, incomplete, leaving some questions which seem to us very important wholly unanswered. It is pretty clear, however, that hereafter we must add the words 'positive thermotropism' and 'negative thermotropism' to the already long list of new terms. — (*Bot. zeit.*, 1883, no. 29.) G. L. G. [299

On the growth of the epicotyl of Phaseolus multiflorus. — In a series of experiments published in 1878, Wiesner detected two maxima of growth characterizing the younger internodes of many plants, whereas Sachs (and more lately Wortmann) had recognized only one maximum. To satisfy himself of the correctness of his former observations, Wiesner has repeated and extended the experiments. His results, derived from more than one hundred cases, show that in the plant named there are two distinct maxima of growth. The measurements were made with Grisebach's auxanometer. — (*Bot. zeit.*, 1883, no. 27.) G. L. G. [300

VERTEBRATES.

Reptiles.

Organ of Jacobson in Ophidia. — Born regarded the cellular columns which form the greater part of the thickness of the roof of Jacobson's organ as "*die zellige ausfüllungsmasse einfacher drüsen von birnförmiger configuration. Sie dicht an einander gedrängt die ganze schleimhaut durchsetzen,*" while Leydig believed them to be largely of ganglionic nature. E. Ramsay Wright agrees with Leydig. He has studied the organ in Eutaenia (embryo and adult). In conclusion, he says, "From the above data I conclude that the cellular columns in the roof of Jacobson's organ are outgrowths of the nuclear stratum of its neuro-epithelium, the polygonal form of which has been determined by the meshes of the capillary plexus, through which the outgrowths have taken place, and that in the course of development more and more of the cells of the nuclear stratum have been pushed outside the boundary formed by the capillary plexus, till eventually little but the superficial stratum is left inside that boundary." — (*Zool. anz.*, vi. 389.) C. S. M. [301

Mammals.

The species of hogs. — M. Forsyth Major is convinced, from his study of the genus Sus, that the sixteen or seventeen species now recognized must be reduced to four; namely, Sus vittatus Müll. and Schleg., S. verrucosus M. and S., S. barbatus M. and S., and S. scrofa Linné. — (*Zool. anz.*, vi. (140), 1883, 295.) F. W. T. [302

Digestion of meats and milk. — Jessen has carried out a series of experiments to determine the time necessary for the digestion of equal quantities of different meats and of milk. Three different methods were employed in the investigation: 1. Artificial digestion; 2. Introduction of the meats into the stomach of a living dog by means of a fistula; 3. Upon a healthy man, allowing him to swallow the foods used, and ascertaining the time of digestion by means of the stomach-pump. The results obtained by the different methods are, on the whole, uniform, as far as the relative time necessary for digestion in each case is concerned, and may be stated as follows: raw beef and mutton are digested most quickly; for half-boiled beef and raw veal, a longer time is necessary; thoroughly boiled and half-roasted beef, raw pork, and sour cow's-milk follow next; fresh cow's milk, skimmed milk, and goat's milk are still less easily digested; while the longest time is required for thoroughly roasted meats and boiled milk. — (*Zeitsch. f. biol.*, xix. 129.) W. H. H. [303

ANTHROPOLOGY.

Iron in the mounds. — F. W. Putnam has had occasion to review some of the statements of the older writers on American archeology, — notably, Mr.

Atwater and Dr. Hildreth, — with reference to the occurrence of iron implements in the mounds. From these statements, such inferences as the following have been drawn: —

The mound-builders understood working iron; they had intercourse with civilized peoples; the mounds were built since the arrival of the whites, or these iron objects belong to intrusive burials. Now, Mr. Putnam demolishes all these deductions at a single blow, by showing that none of the objects are iron. In other words, Mr. Atwater's "handle of either a small sword or a large knife" was an antler, in one end of which a hole had been bored, and around this part was a band of silver. The blade was evidently of native, cold-hammered copper. Dr. Hildreth's silver-plated ear-ornament is duplicated in some of our museums by a kind of plating, first described by Mr. Putnam. In this discussion, some light is thrown upon the spool-shaped copper objects that have been so long a puzzle to archeologists, by the finding of pieces of 'leather' between the plates, very closely resembling the skin from the ear of a Peruvian mummy. Important discoveries made during the last year, in mounds in Ohio, by Dr. C. L. Metz and Mr. Putnam, have brought to light a number of copper ornaments, some of which are covered, or plated, with thin layers of silver. The investigation shows us quite conclusively that we are no longer safe in our archeological deductions, except in the hands of a skilful guide. — (*Proc. Amer. antiq. soc.*, ii. 349.) O. T. M. [304

Aztec music. — Mr. H. T. Cresson has been studying the musical instruments of the ancient Mexicans. The *huehuetl*, or large drum of the great temple, at the ancient pueblo of Tenochtitlan, was covered with the skins of serpents, and when beaten could be heard at a distance of several miles. Clay balls were placed inside of their grotesque clay images, also within the handles attached to their earthenware vessels, which are generally hollow. Some of these rattles in the Poinsett collection resemble the head of Crotalus horridus, and give forth a rattling sound. In this connection Mr. Cresson makes a very suggestive observation which we do not remember to have seen before: "It may therefore be supposed that these children of nature noticed and strove to reproduce sounds, which, however harsh and unmusical to us, to them were pleasing, because they recalled familiar objects." The author thinks he can recognize the Mexican Hyladae, macaws, parrots, and other bird-calls. A musical vase is spoken of. Mr. Barber's assertion that the fourth and seventh are wanting from the diatonic scale is denied, since, in the Poinsett collection, there exist Aztec flageolets capable of producing not only the fourth and seventh of the diatonic scale, but also the entire chromatic scale. This subject is elaborated at great length. Mr. Cresson thinks that the musicians of our day have arrived at a somewhat hasty decision in regard to the music of these ancient people, and its confinement within the narrow limits of a pentatonic scale. — (*Proc. acad. nat. sc. Philad.*, 86.) J. W. P. [305

NOTES AND NEWS.

THE resolution of the American association, offering all the privileges of membership for next year's meeting to the members of the British association, was received by the latter with much enthusiasm; and the council of the British association, with which such matters lie, will, it is said, extend a similar invitation to the American association. The Canadian authorities have arranged for such members of the British association as may desire, to take the longer excursions planned for them *before* their meeting on Aug. 27, and thus allow them to attend the meeting of the American association in Philadelphia, Sept. 3, without losing their excursions. It is hoped that at least five hundred members of the British association, including many leading scientific men, will attend the Montreal meeting; while there seems to be a very general wish, more especially on the part of the younger scientific men, to attend the Philadelphia meeting as well.

— The following is the list of grants of money, which, according to *Nature*, the British association has granted for scientific purposes for the coming year; amounting, in all, to seven thousand dollars. When may we hope for even the beginning of such a list from the American association, with its two thousand members?

A. — Mathematics and physics.

Brown, Prof. Crum, Meteorological observations on Ben Nevis	£50
Foster, Prof. G. Carey, Electrical standards	50
Schuster, Prof., Meteoric dust	20
Abney, Capt., Standard of white light	20
Scott, Mr. R. H., Synoptic charts of the Indian Ocean	50
Stewart, Prof. Balfour, Meteorological observatory near Chepstow	25
Shoolbred, Mr. J. N., Reduction of tidal observations	10
Darwin, Prof. G. H., Harmonic analysis of tidal observations	45

B. — Chemistry.

Odling, Prof., Photographing the ultra-violet spark spectra	10

C. — Geology.

Etheridge, Mr. R., Earthquake phenomena of Japan	75
Williamson, Prof. W. C., Fossil plants of Halifax	15
Sorby, Dr. H. C., British fossil polyzoa	10
Prestwich, Prof., Erratic blocks	10
Etheridge, Mr. R., Fossil Phyllopoda of the paleozoic rocks	15
Hull, Prof. E., Circulation of underground waters	15
Evans, Dr. J., Geological record	15
Green, Prof. A. H., Raygill fissure	15
Prestwich, Prof., International geological map of Europe	20