aluminium 25, lead 0·29, gold 0·28, and platinum 0·25. The author also found a slight difference between the transparency of solid substances and their powders, which shows that there is some reflection or refraction. Loose powder was even less transparent than pressed powder.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 21.—"Note on the Larva and Post-larval Development of *Leucosolenia variabilis* H. sp., with Remarks on the Development of other Asconidæ." By E. A. Minchin.

The larva of *Leucosolenia variabilis* is an amphiblastula of a primitive type, transitional in many respects between the larva of the lower Ascons and the amphiblastula of the Sycons. It has an anterior ciliated, and a posterior non-ciliated pole, but when first hatched the ciliated pole is relatively very large, and the non-ciliated cells are few in number. During the free-swimming larval period the non-ciliated cells increase through their numbers being recruited from the ciliated cells, of which those situated more posteriorly become modified into granular cells after passing through an intermediate stage. In addition to anterior ciliated cells, posterior granular cells, and the equatorial zone of intermediate cells, the larva has cells of a fourth kind, placed in the centre of the body, immediately behind the minute central cavity, which contains gelatinous matter and is surrounded laterally by a ring of pigment lodged in the inner ends of the ciliated and intermediate cells. The central cells, together with the pigment, appear to constitute a larval organ, perhaps sensitive to light, which is lost at the metamorphosis.

The larva swims for 36-48 hours and fixes by the anterior pole. The granular cells grow round the ciliated cells, and the former become the dermal layer, the latter the gastral layer. At first the dermal layer forms an epithelium of a single layer, which becomes two-layered by immigration of certain of its cells. The dermal cells which remain on the surface secrete each a single monaxon spicule; those which migrate inwards arrange themselves into groups, and secrete the tri- and quadri-radiate spicules. While these changes are taking place in the dermal layer, a central cavity has appeared, round which the gastral cells arrange themselves in a columnar epithelium and gradually assume the characters of collar cells. At one spot the cavity is not lined by gastral cells, but by dermal cells only; it is here that the osculum is formed about the sixth day of fixation.

In the other Ascons investigated—*L. cerebrum*, *L. coriacea*, and *L. reticulum*—the larvæ are oval ciliated blastulæ in which an inner mass of cells is formed by modification and subsequent immigration of certain of the ciliated cells. In *cerebrum* and *coriacea* the immigration appears to be multipolar; in *reticulum* it takes place from the posterior pole, and thus affords a transition to the above-described larva of *variabilis*. If the cavity of the larva of *reticulum* be imagined reduced to the extent to which this has occurred in *variabilis*, then the modified cells at the hinder pole, instead of migrating inwards, must remain where they are, and as more ciliated cells become modified around them, a type of larva is obtained with ciliated cells anteriorly, intermediate cells laterally, and non-ciliated cells posteriorly, as in *variabilis*. This homology is further borne out by the fact that in all these larvæ the inner mass becomes the dermal layer, and the ciliated cells become the gastral layer, as the result of changes in position which take place at the metamorphosis. The post-larval development of the layers is similar to that described for *variabilis*.

When the development of *L. variabilis* is compared with that of Sycon as described by Schulze and Metschnikoff, it is seen that the only difference between them lies in the periods at which the events take place. In Sycon the larva, while still in the maternal tissues, undergoes changes which in *variabilis* take place during the free-swimming period, and the dermal cells surround the gastral cells before fixation in Sycon, instead of after fixation, as in *variabilis*.

The primitive larva of Calcarea was probably a ciliated blastula, in which an inner mass, the future dermal layer, was formed by modification and immigration of certain of the cells.

The immigration of cells from the dermal layer to form the triradiate spicules is precisely similar to what occurs in the adult whenever new spicules arise. Hence this process is not to be regarded as one of blastogenetic, but of histogenetic significance. In other words, sponges are to be regarded as two-layered animals, and not as possessing a mesoderm.

June 18.—"On Fertilisation, and the Segmentation of the Spore, in *Fucus*. By Prof. J. Bretland Farmer and Mr. J. Ll. Williams.

An account was given of an investigation into the mode of formation of the oospheres, of their fertilisation by the antherozoids, and of the germination of the resulting spores in various members of the Fucaceæ, special attention being paid to the protoplasmic structures therein concerned. The chief points were illustrated by lantern-slides from photomicrographs.

In order to study the fertilisation and germination stages, diœcious species were selected, and the male and female plants were kept in separate dishes, covered over so as to prevent drying up. This method gave far better results than those more usually advocated. On the appearance of the extruded sexual products, the female receptacles were placed in sea water, and after the complete liberation of the oospheres, a few male branches with ripe antherozoids were first placed in a capsule of sea water until it became turbid owing to their number. If on examination the antherozoids proved to be active, small quantities were added to the vessels containing the oospheres. The latter were then fixed at intervals of five minutes during the first hour, and then at intervals of fifteen minutes, up to six hours after the addition of the antherozoids. After that, samples were killed at longer intervals up to three days, and this was continued till we had material fixed at all stages for the first fortnight. At first sea water was used in which to keep the embryos growing, but a proper solution of Tidman's sea salt was found to answer quite as well. A large number of fixing reagents were tried, but Flemming's solution diluted with sea water gave the best results. Many reagents in common use proved utterly worthless. In embedding the tissues and spores in paraffin, previous to cutting them, it is important not to allow the temperature to rise above 50° C.

When an oogonial nucleus is about to divide, it first becomes slightly, then very much, elongated so as to resemble an ellipse. Fine radiations are seen to extend from the two ends into the surrounding cytoplasm. The latter is at first tolerably uniformly granular, but as the radiations around the polar areas increase, these regions become cleared altogether of the granules which then become massed outside them. The nucleus rapidly becomes more spindle-shaped, and its chromatic elements are chiefly grouped near each pole, leaving a clear space about the equator in which the nucleolus is situated.

The polar radiations continue to increase and the nucleus to lengthen, until the entire structure recalls the figure of a dumb-bell, in which the nucleus answers to the handle, and the radiation areas to the knobs. If the radii be traced outwardly, they are seen to terminate either in the frothy protoplasm, on the angles where the foam walls meet, or on the large granules which surround the cleared areas and are embedded in the foam. No structures were seen which could *certainly* be identified as centrosomes, although bodies suggestive of them were often observed; but these proved to be so variable in size and position, as well as in number, that it appeared impossible to attach any special significance to them.

The achromatic spindle is remarkable, inasmuch as it is intranuclear. The chromosomes were too minute to admit of their development being satisfactorily studied, but in all the *oogonial* spindles the number was estimated as *ten* when seen in profile. After the delimitation of the oospheres, some of them were observed to contain more than one nucleus. This is an abnormal feature, and the non-recognition of this fact has led to mistaken views in the past. When the oospheres are extruded, and come to lie free in the water, they swell somewhat, and are turbid with granules, which are very abundant in the cytoplasm. About five minutes after the mixing of the sexual cells, the antherozoids are found to have slipped into many of the oospheres. The act of penetration was not observed, but, in a number of cases, the antherozoid could be recognised within the oosphere, before its final fusion with the nucleus of the latter. It is a roundish, densely staining body, and, unlike the majority of animal sperm cells as yet described, no system of radiations are associated with it when in the egg. Judging from the short period of time elapsing between its penetration of the surface of the oosphere and its arrival at the exterior of the female nucleus, it must pass through the intervening cytoplasm with great rapidity. It then becomes closely appressed to the nucleus, and is about as large as the nucleolus of the latter. It rapidly spreads over a part of the female nucleus as a cap, and it presents a less homogeneous aspect than before. Both it and the female nucleus assume a granular character, which is probably to be interpreted as representing a coiling and looping of the linin of the respective nuclei. Finally the two nuclei coalesce, and the original components can no longer be distinguished. Complete fusion may be effected in less than ten minutes after the addition of the antherozoids to the water.

A delicate pellicle is meanwhile formed around the periphery of the oosphere, which is thus easily distinguished from the unfertilised oospheres, in which such a membrane is wanting. The texture of the cytoplasm also changes, and tends to assume a more definitely radiating character, the lines starting from the nucleus as a centre.

After fertilisation, the cells rest for a long interval of time—commonly about twenty-four hours—before they begin to segment. The principal changes which occur during the interval are, first, in the rapid increase in the thickness of the peripheral cell wall, and, secondly, in the more regular arrangement of structure exhibited by the protoplasm. The alveolar or foam character is extremely clear, and the chromatophores, which by this time have become very prominent, are noticed to be situated in the angles formed by the convergence of the foam walls; they are often bent and otherwise distorted, and so accommodate themselves to the structural condition of the foam.

The first segmentation-division resembles, in a general way, the oogonial nuclear divisions already described. The achromatic fibrils forming the polar radiations are clearly seen to be attached to the foam-like structure of the cytoplasm, and, in some cases, insensibly to pass into it. At other times fibrils end on granules (or, perhaps, on the protoplasmic lining of the granules), and sometimes again a fibril may fork, and its branches end either on granules or on the foam angles. The interpolar portion of the spindle is intranuclear, and the chromosomes, when arrayed at its equator, are seen to be *twice as numerous* as those in the oogonial spindles. This doubled number is maintained throughout the thallus divisions, and the reduction in their number only occurs in connection with the actual differentiation of the sexual cells. The theoretical conclusions to be drawn from these facts were briefly indicated by the authors.

"Phenomena resulting from Interruption of Afferent and Efferent Tracts of the Cerebellum." By Dr. J. S. Risien Russell, Research Scholar to the British Medical Association.

Continuing his researches into the functions of the cerebellum, the author has directed his attention to the effects of dividing one inferior peduncle of this organ. He finds that in the disorders of equilibration which result, the direction of rotation is towards the side of the lesion, or, in other words, if, as was always the case, the left peduncle was divided, the animal rotated like a right-handed screw entering an object.

The disorders of motility which result from such a lesion correspond exactly with those observed after ablation of one lateral half of the organ, and consist in defective movement in the limbs on the side of the divided peduncle, and of the posterior limb of the opposite side. It is suggested that these effects may result from the interruption of afferent impulses passing to the cerebellum, rather than from the cutting off of efferent impulses from the cerebellum to the spinal centres. The interruption of similar impulses are held responsible for the displacement of both eyes downwards and to the opposite, a displacement which also resulted after removal of one lateral half of the cerebellum.

Spasm, which was easily detected in the back and neck muscles on the side of the lesion, causing incurvation of the vertebral axis to that side, alone furnished any satisfactory information in support of the view that the cerebellum exerts an inhibiting influence on the spinal centres; but the tendon reflexes afforded no satisfactory information on this point.

Sensibility was blunted on those extremities in which motor power was defective, a point in favour of the author's previous contention that the cerebellum is concerned with sensory as well as with motor processes.

The excitability of the cortex of the opposite cerebral hemisphere to the Faradic current was less than that of the hemisphere on the same side as the divided peduncle, a result which strengthens the view that one lateral half of the cerebellum exerts a control on the opposite cerebral cortex, as was suggested by certain results previously obtained by the author, and which further points to the possibility that the cerebellum is in its turn inhibited by afferent influences which reach it from lower centres. This view is made still more probable by the remarkable results obtained by the intravenous injection of absinthe after division of one inferior peduncle of the cerebellum, for during the otherwise general convulsions which resulted, there was a complete absence of convulsions in the muscles of the anterior extremity on the side of the lesion, and a diminution of the convulsions in the muscles of the posterior extremity of the same side.

These results were supplemented and controlled by other experiments in which the lateral tracts of the medulla oblongata were divided on one side without injury to the pyramid, by others in which the posterior columns and their nuclei were divided on one side, and by others in which partial hemisection of the medulla was performed, including all the structures on one side with the exception of the pyramid.

PARIS.

Academy of Sciences, July 13.—M. A. Chatin in the chair.—On the flow of liquids in large rectangular channels, and in pipes or canals of circular or semicircular section, by M. J. Boussinesq.—On the law of corresponding states of Van der Waals, and the determination of the critical constants, by M. E. H. Amagat. Some applications of the method of projection described in a previous note. Taking the critical constants of any one substance, the determination of which may be looked upon as the most trustworthy, the critical constants of any other substance may be determined in terms of these from the experimental pv curve.—On a new method for the determination of the respective distances of the centres of cerebral localisation, by M. C. Henry.—Remarks, by M. Langlois, on a new theory of capillarity.—On the fixing of photographs in colour on paper, by M. A. Graby.—Aërial navigation, by M. L. Gardère.—On differential equations of the first order, by M. P. Painlevé. A reply to a note of M. Korkine.—On groups of substitutions, by M. G. A. Miller.—On the function ζ (s), by M. Hadamard. Pointing out that a part of a proof given in a preceding note is not rigorously true.—On the displacement of the axis of rotation of a solid body of which a part is rendered instantaneously mobile with respect to the rest of the mass, by MM. Edmond and Maurice Fouché.—On the elastic equilibrium of a revolving body, by M. L. Lecornu.—On a graphical representation of luminous waves, by M. G. Vert.—On the verification of the theorem of corresponding states, by M. C. Raveau. By taking the logarithms of pv and p as co-ordinates, instead of pv and p, the method suggested by M. Amagat is much simplified in its application.—On an absolutely astatic galvanometer of high sensibility, by M. A. Broca.—On the vaporisation of metals at the ordinary temperature, by M. H. Pellat. Results similar to those obtained by M. Colson with zinc are obtainable with steel. In view of the experiments of M. Becquerel with metallic uranium, it is suggested that similar invisible radiations, and not the vapour of the metal, may produce the effects observed.—Method for photographing in reverse, objects in relief, by M. E. Moussard.—On the manner in which the X-rays cause the discharge of electrified bodies, by M. Émile Villari. Some experiments tending to show that the discharge is due to convection currents in the air surrounding the charged body.—The action of tubes and metallic discs upon the X-rays, by the same.—The action of the Röntgen rays on the diphtheric bacillus, by M. F. Berton. No attenuation of the virus could be obtained by exposure to the rays for forty-eight hours.—On the fusibility of metallic alloys, by M. Henri Gautier. A study of the fusibility curves allows of the prediction of the existence of the following alloys of definite composition: Ni_3Sn_2, SnAl, Ag_2Al, and SbAl, the last of which was isolated by C. Alder Wright.—Diamonds in steel, by M. Rossel.—Action of silicon upon certain metals, by M. E. Vigouroux. The alkali metals, zinc, aluminium, lead, tin, antimony, bismuth, gold and silver dissolve silicon more or less, but do not combine with it directly. Iron, chromium, nickel, cobalt, manganese, copper and platinum, on the other hand, form definite silicides.—Researches on the double cyanides, by M. R. Varet.—Action of water upon formic aldehyde, by M. Marcel Delépine. Formic aldehyde with water at 200° gives CO, CO_2, formic acid and methyl alcohol.—Reduction of crotonic aldehyde, by M. E. Charon. By the use of the zinc-copper couple in acetic acid solution two unsaturated alcohols are obtained:

$$CH_3.CH:CH.CH_2OH$$

and

$$CH_3.CH:CH.CH(OH).CH(OH)CH:CH.CH_3.$$

—Rapid estimation of carbon dioxide in the air and confined spaces, by M. Henriet. The gas is absorbed in potash, and the latter titrated with sulphuric acid, using phenol-phthaleïn as indicator.—Termination of the muscular sensory nerves on the striated bundles, by M. C. Rouget.—On the electroneuro-muscular circuit, by M. E Solvay.—Cutaneous evaporation in the rabbit. Modifications under the influence of electrical excitement, by M. Lecercle. Under the influence of galvanisation the cutaneous evaporation is increased.—On the order of succession of the fauna of the Upper Lias near Luçon, by MM. Chartron and Welsch.—On the topaz crystals of Perak, by MM. A. Lacroix and Sol.—On the estimation of gluten in flour, by M. Balland.—On the treatment of such diseases as gout and diabetes by high frequency currents, by M. Vigouroux.—On the results furnished by orchitine in the treatment of leprosy, by M. Bouffé.

PHILADELPHIA.

Academy of Natural Sciences, June 23.—Rev. H. C. McCook reported a series of observations on the California trap-door spider, *Cteniza Californica*, made by Dr. Davidson, who has been able to determine the time required for the construction of the burrow in confinement, and other matters connected with the life-history of the animal. It has taken ten hours to construct the nest with its hinged door, another spider having made a hole large enough to conceal itself in two hours. The method of digging was the same in the main as that described by Dr. McCook for the tarantula. The young, when they emerge, at once build their own miniature nests, which are renewed every spring until they reach the full size. Based on the study of a Lycosid, the speaker had predicted that the enemy of the trap-door spider would be found to be a diurnal wasp. Dr. Davidson had established the fact that such is the case, and that the attacking species is *Parapompilus planatus*, Fox.—Mr. H. C. Mercer made a report on his recent exploration of certain caves in Tennessee, which he had been able to prosecute under the patronage of the University of Pennsylvania, mainly through the liberality of Dr. William Pepper. In Zirkel's cave on Dumpling Creek, Jefferson County, Tennessee, crusts of breccia projected from the walls and hung from the roof. From this material the teeth of the tapir, peccary, &c., projected, while in the cave below were found bones, nuts, two pieces of Indian pottery and fragments of mica, probably indicating Indian burial cave. There were therefore two ages indicated: one ancient, by the breccia, and the other, the cave earth, comparatively recent. All the fossil remains belonged to the breccia, and there was no association between them and the indications of human life. Another cave on the Tennessee River, under Lookout Mountain, Hamilton County, Tennessee, presented a floor of two layers, the black top one, of three or three and a half feet in thickness, composed of Indian remains, and another of yellow earth containing a few animal remains but no indication of human existence. Mylodon and Tapirus fragments, found some time ago close to the bottom of the upper layer, had probably been scraped up from the lower. Neither, therefore, did this cave present any certain data for the advancement of the date of man's antiquity. On the contrary, the evidence supported the belief that pleistocene or palæolithic man had not existed in that region. On penetrating the forbidden entrance of Big Bone Cave, near Caney Fork River, Van Buren County, Tennessee, he had found, nine hundred feet in, the bones of *Megalonyx* still bearing articular cartilages. Fragments of torches were found beneath the sloth bones, probably buried by burrowing rats. Prof. E. D. Cope commented on the fossil bones collected in the caves described by Mr. Mercer. The presence of cartilages on the *Megalonyx* bones indicated for them an age certainly not more remote than the existence of man on this continent. Other bones belonging to young individuals were larger than corresponding ones found at Port Kennedy, indicating the validity of the two species: *Megalonyx Wheatleyi* and *M. Jeffersonii*. Mr. Mercer had also collected remains of fifteen or twenty species of birds, six fishes, one batrachian, four tortoises, one rattlesnake, and nineteen mammals. The special value of Mr. Mercer's careful work was commented on. The peccary is found in Zirkel's cave, although no trace of it appears in the Lookout Mountain cave. Several undescribed species were indicated.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Catalogue of the Fossil Bryozoa in the Department of Geology (Natural History): Dr. J. W. Gregory: The Jurassic Bryozoa (London).—Glasgow and West of Scotland Technical College, Calendar for the Session 1896-7 (Glasgow).—The Biological Problem of To-day: Dr. O. Hertwig, translated by P. C. Mitchell (Heinemann).—Die Formen der Familie und die Formen der Wirthschaft: E. Grosse (Freiburg, Mohr).

PAMPHLETS.—Tesi de Fisica e Meccanica: G. Casazza (Milano).—Field Columbian Museum, Annual Report for the Year 1894-95 (Chicago).—Fiftieth Annual Report of the Director of the Astronomical Observatory of Harvard College: E. C. Pickering (Cambridge, Mass.).—Die Saturniiden: A. R. Grote (Hildesheim).

SERIALS.—Records of the Geological Survey of India, Vol. xxix. Part 2 (Calcutta).—Indian Museum Notes, Vol. 3, No. 6; Vol. 4, No. 1 (Calcutta).—Science Progress, July (Scientific Press).—Journal of the Royal Microscopical Society, June (Williams).—Annals of the Astronomical Observatory of Harvard College, Vol. xl. Part 4; Vol. xli. No. 3; Vol. xxxiv. (Cambridge, Mass.).—Journal of the Academy of Natural Sciences of Philadelphia, 2nd series, Vol. x. Part 3 (Philadelphia).—Lloyd's Natural History. Cats, Civets, and Mungooses: R. Lydekker, Part 1 (Lloyd).—Psychological Review, July (Macmillan).—Bulletin de l'Académie Royale des Sciences de Belgique, 1896, No. 5 (Bruxelles).—Journal of the Royal Statistical Society, June (Stanford).—Journal of the Franklin Institute, July (Philadelphia).—American Journal of Science, July (New Haven).—American Naturalist, July (Philadelphia).—Zeitschrift für Wissenschaftliche Zoologie, lvi. Band, 3 Heft (Leipzig, Engelmann).—Strand Magazine, July (Newnes).—Quarterly Review, July (Murray).—Proceedings of the Physical Society, Vol. 14, Part 7 (Taylor).—Lean's Royal Navy List, July (Witherby).—Engineering Magazine, July (Tucker).—Annales de l'Observatoire Astronomique de Moscou, deux série Vol. 3, Livr. 2 (Moscou).—Journal of Anatomy and Physiology, July (Griffin).—Bulletin of the American Mathematical Society, June (New York, Macmillan).—Memorie della Società Geografica Italiana, Vol. vi. Parte Prima (Roma).—Lloyd's Natural History. Cats, &c.: R. Lydekker, Part 2 (Lloyd).—Zeitschrift für Physikalische Chemie, xx. Band, 2 Heft (Leipzig, Engelmann).—Transactions of the Royal Society of Edinburgh, Vol. xxxvii. Parts 3 and 4; Ditto, Vol. xxxviii. Parts 1 and 2 (Edinburgh, Grant).—Proceedings of the Royal Society of Edinburgh, Vol. xxi. No. 1 (Edinburgh).—Archives of Clinical Skiagraphy, No. 2, Vol. 1 (Rebman).

CONTENTS.