

of auroræ are seen when sun-spots are at their minimum, that is, at a time when in our own latitudes the number is smallest; and, on the other hand, we have Nordenskiöld's observations, which seem to point in the opposite direction. In a publication which contains much important matter on the geographical distribution and form of the aurora borealis, Nordenskiöld contrasts the appearances he has observed in the *Vega* during the winter of 1878-79, passed in the Behring Straits, with that previously observed in 1872-73 to the north of Spitzbergen. According to this author, the auroræ, during the minimum sun-spot period in 1878-79, were "hardly worthy of his notice by the side of those observed in 1872-73." But although only faintly luminous, the auroræ of 1879 were persistent and regular in shape. They did not affect the magnetic field, and seem to show a regular and continuous, though weak, electric discharge. The arcs and streamers in 1872 were much more brilliant and much more irregular. Some objection may be raised against these observations, in so far as they refer to different places, and local circumstances may have affected the phenomenon; but in the face of the very careful description he gives us, we cannot as yet accept Paulsen's results without further confirmation.

The problem of atmospheric electricity, like that of terrestrial magnetism, presents special features in the arctic regions, and until we possess a greater number of observations in those little accessible parts of the earth's surface, many important problems cannot be satisfactorily solved. Arctic and antarctic expeditions are of interest to scientific men, not because they care much whether we get a few miles nearer the pole, but because a well-conducted party collects invaluable information on its journey. Although much remains to be done in the regions surrounding the north magnetic pole, our knowledge in the southern hemisphere is almost disgracefully inadequate, and it is to be hoped that before long a well-equipped expedition may fill up to a certain extent the large gaps in our electrical and magnetical knowledge which at present stop so many of our researches.

But although investigations to be conducted in the arctic regions are of primary importance, we may do much nearer home in extending and completing existing information. Instrumental appliances and methods of observation, originally put into a satisfactory state by Lord Kelvin, have been improved, especially by Mascart, Exner, Elster, and Geitel. One of our most crying wants at present is a series of continuous observations by means of self-registering instruments in places where the neighbourhood of a town, or other local circumstances, do not interfere with the normal changes. The Greenwich Observatory, to which we look for help in such matters, is placed in the difficulty that the daily variations there observed are markedly different from those in the majority of places, and it is probable that the nearness of London is fatal to any generally useful series of observations of atmospheric electricity being conducted in our national Observatory.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE annual general meeting of the Association of Technical Institutions will be held at the Goldsmiths' Hall on Friday, the 24th inst.

THE Senate of University College, Liverpool, on the joint recommendation of Profs. Lodge and Hele Shaw, have appointed Mr. Alfred Hay, B.Sc., of University College, Nottingham, to the Lectureship on Electrotechnics, vacant by reason of the election of Mr. F. G. Baily to the chair of Electrical Engineering at the Heriot-Watt College, Edinburgh.

MR. L. F. GOLDSTAND has presented the Royal Agricultural College, Cirencester, with the sum of £200 for the institution of three silver medals annually, to be awarded according to results of the final examination for the diploma, at the discretion and decision of the Principal. The donor has requested that the medals be styled the "McClellan," the "Harker," and the "Goldstand," respectively; and the Principal, on behalf of the Governing Body, has accepted and ratified the donation.

THE eighth annual report, just published by the National Association for the Promotion of Technical and Secondary Education, is a mine of statistical and other information referring to the development of educational organisation in Great Britain. Substantial progress is recorded in the work of

technical education; and it appears that of the £744,000 annually available in England alone, £600,000 is being spent on education. In the year covered by the report, 7252 scholarships and exhibitions, of the total yearly value of £40,598, were offered by thirty-seven counties. A large section of the report is devoted to summarising the recommendations of the Royal Commission on Secondary Education.

AMONG recent appointments and nominations abroad, we notice the following:—Dr. Hürthle to be Extraordinary Professor of Physiology at Breslau; Dr. N. Busch to be Director of the Botanic Garden of the University of Dorpat; Dr. K. G. Huefner, Professor of Organic and Physiological Chemistry at Tübingen, to succeed the late Prof. Hoppe-Seyler at Strassburg; Dr. Bauschinger, of Munich, to succeed the late Prof. Tietjen as Extraordinary Professor of Astronomy at Berlin; Dr. Anton F. v. Eiselsberg, Professor of Surgery at Utrecht, to be Prof. Braun's successor at Königsberg; Dr. H. Nichols to be Lecturer in Psychology in the Johns Hopkins University, Baltimore.

SCIENTIFIC SERIALS.

The Quarterly Journal of Microscopical Science for August 1895 contains: On the variation of *Halicystus octoradiatus*, by Edward T. Brown (plate 1). Some 154 specimens were examined, 120 of these were perfectly normal but 34 afforded either cases of congenital variation, or showed regeneration of organs after destruction or injury. Most of the abnormal forms are figured.—On the collar-cells of Heterocœla, by George Bidder (plate 2). Observations were made on *Leucandra aspera*, *Sycon raphanus*, *S. compressum*; this last was found best suited for examination under high powers during life, its collar-cells are among the largest, if not as large, as any known. The protoplasm of these cells is in life greenish, and they have nearly the form and relation to each other of full corn-sacks standing side by side in a granary. The living collar is invariably an almost perfect cylinder, very little constricted at its base. As to Sollas's membrane, the statements of Vosmaer and Pekelharing, which the author once thought erroneous, he now confirms, there is no normal union of the collars, the membrane is only to be met with in "paraffin sections."—The metamorphosis of Echinoderms, by Henry Bury (plates 3-9). With the view of clearing up some of the differences in observation and opinion of the more recent observers of the metamorphosis of this group, the author has worked out as far as possible the metamorphic changes of at least one form of larva in each of the five classes of Echinoderms; for reasons given, the metamorphosis of Synapta is written in greater detail than that of the rest. As to the relation of the Echinodermata to the Enteropneusta, "there seems to be a chain of evidence of their connection, which though not indeed conclusive—that embryological evidence alone can never be—is at least as strong as that which binds together any two of the great subdivisions of the animal kingdom."—A criticism of the cell-theory; being an answer to Mr. Sedgwick's article on the inadequacy of the cellular theory of development, by Gilbert C. Bourne. The article of Prof. Sedgwick here criticised appeared in the *Q.J.M.S.* for November 1894.

The number for November 1895 contains:—On the distribution of assimilated iron compounds, other than Hæmoglobin and Hæmatins, in animal and vegetable cells, by Dr. A. B. Macallum (plates 10-12). After some preliminary remarks on the special literature of the subject and references thereto, the author details his methods of study. This portion of the memoir is very instructive, not only for the facts recorded, but for the hints given; chlorophyll yields no evidence that it contains iron, and it is mentioned incidentally that species of *Monotropa* remain colourless when fixed in solutions of corrosive sublimate. The greater part and sometimes the whole of the assimilated iron in the cells of the higher forms of animal life is held in the nucleus, in the chromatin of which it is chiefly found, and the same is true of the nuclei of all the higher vegetable organisms; it is rarely found in the cytoplasm of the cells, but full details of such occurrences are given. An important section is devoted to the occurrence of assimilated iron in special forms of life, such as in protozoa, fungi, bacteria, and the Cyanophyceæ.—On the structural changes in the reproductive cells during the spermatogenesis of Elasmobranchs, by J. E. S. Moore (plates 13-16). The author establishes a long series of structural homologies found before, during, and after the synaptic phase in the repro-

ductive cycles of both animals and plants, and so close is their correspondence, amid a host of complex structural details, that it is in the highest degree improbable that the two series of phenomena can have been independently evolved; and whatever the synapsis may eventually turn out to be, it is evidently a cellular metamorphosis of a profoundly fundamental character, which would appear to have been acquired before the animal and vegetable ancestry went apart, and to have existed ever since.—Notes on the fecundation of the egg of *Sphærechinus granularis*, and on the maturation and fertilisation of the egg of *Phallusia mammillata*, by M. D. Hill (plate 17). In these forms there is no egg astrophere or egg centrosome; both these structures are brought into the ovum by the spermatozoon, and they give rise by division to all the subsequent astropheres and centrosomes throughout ontogeny. There is consequently no such thing as a “quadrille.”—Further remarks on the cell-theory, with a reply to Mr. Bourne, by Adam Sedgwick, F.R.S.

Simons's Monthly Magazine for December contains a climatological table and summary for various selected stations of the British Empire, for the year 1894. Australia records the highest shade temperature, viz. 107°° at Adelaide, on November 26, and it was the driest station. In the twelve years for which the annual summaries have appeared, this station has yielded the highest maximum in ten years, Melbourne in one, and Calcutta in one. The lowest temperature in the shade was recorded at Winnipeg, -46°·1 on January 24. This station has never been equalled for lowness of absolute shade temperature, and has only twice failed to record the greatest mean daily range; the variation during the year amounted to 141°·9. The dampest station was Esquimalt, where the mean humidity was 88 per cent.; London comes next, being 81 per cent., and both these places were the most cloudy, the average amount being 6·3. The least cloudy stations were Bombay and Grenada, where the average amount was 4·0. The greatest annual rainfall, 77·5 inches, occurred at Colombo, and the least, 18·1 inches, at Winnipeg. The Cape of Good Hope observations were unfortunately missing.

L'Anthropologie, 1895, Tome vi. No. 4.—Quaternary deer of Bagnères-de-Bigorre (Hautes-Pyrénées), by Édouard Harlé.—A careful examination of the mandible has led the author to the conclusion that the animal to which it belonged was neither a reindeer nor a stag, but that it must be considered a variety of the fallow-deer; and its presence in conjunction with *Elephas primigenius*, *Rhinoceros tichorinus*, and the reindeer, at the foot of the Pyrenees, is a fact of some interest.—Note on the age of metals in the Ukraine, by Baron de Baye. The progress of civilisation was not uniform in the north and south of Russia in Europe. In the district south of a line which corresponds very closely with the 50th parallel of latitude, it has been found that the use of metals was known at a very early date, whilst the Stone Age continued for a much longer period in countries to the north of this line. Baron de Baye is careful to explain that the term “Scythian,” which he uses freely in connection with the mounds and the various bronze articles found in them, does not express an anthropological unit, but is used in a purely geographical and ethnological sense. The numerous tribes, however, comprehended under this name had the same civilisation, practised the same arts and the same funeral rites, and left behind them similar archaeological remains.—Anthropological observations on the tumuli and worked flints of the Somali and the Danakil, by Dr. Jousseume. The tombs are constructed of rough stones, more or less spherical or ovoid in shape, and of various sizes. The flints are arranged by the author in four groups, the first of which is represented by a single specimen in the form of a wedge. The second group is spatulate, rather long, very thick, and always larger at one end than the other. The flints included in the third group are discoidal, and of various sizes; while the fourth group includes all those that are lance-shaped.—Infantilism, feminism, and the hermaphrodites of the ancients, by Henry Meige. In this section of his paper the author treats of feminism, of which a very beautiful example came under the observation of Prof. Charcot at La Salpêtrière.

Bollettino della Società Sismologica Italiana, vol. i., 1895, No. 6.—Earthquake of Paramythia (Epirus) during the night of May 13-14, 1895, by G. Agamennone (see p. 205).—The Guzzanti microseismoscope, by G. Guzzanti.—Notices of Italian earthquakes (April-May 1895), referring chiefly to the Florentine earthquake of May 18, and to the pulsations of the earthquake of Paramythia of May 13-14.

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SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 28, 1895.—“The Expansion of Argon and of Helium as compared with that of Air and Hydrogen.” By Dr. J. P. Kuenen, Professor of Physics in University College, Dundee, and Dr. W. W. Randall, Lecturer in John Hopkins University, Baltimore, U.S.A.

The gas-thermometer used for these experiments was such as could be easily heated by means of a “Ramsay and Young” vapour-jacket. It consisted of a bulb sealed on to a capillary tube, which in turn was sealed on to a wider tube, provided with a mark. This mark is situated just outside the heating arrangement, immediately below the capillary tube. The inner mercury-surface is made to coincide with this mark, and both this one and the outer surface are read on a scale with a telescope. The readings were duly corrected for capillary action, expansion of glass and mercury, and the part of the gas that is not heated. The results show that up to 240° C., the highest temperature that was employed, the expansion of both argon and helium is very nearly the same as that of air and hydrogen.

December 5, 1895.—“Studies in the Morphology of Spore-producing Members. Part II. Ophioglossaceæ.” By F. O. Bower, F.R.S. Preliminary Statement on the Sorus of *Danaea*, by F. O. Bower, F.R.S.

In Part I. of these studies it had been shown on comparative grounds to be probable that septation of sporangia, previously in the race simple, had taken place among the Lycopodineæ. It appeared, however, important to show that such a process of septation has taken place elsewhere; examples of it are found in the anthers of many Angiosperms of the orders Mimoseæ, Onagraceæ, Lorantheæ, Rhizophoreæ, &c. The development has been studied in certain cases, and it is seen that a partial sterilisation of sporogenous cells results in the formation of sterile septa, which may vary greatly in thickness from a broad band of tissue to a narrow one; sometimes the septum may be represented by a single layer of cells of the nature of a tapetum, or the septum may be incomplete. A comparison of these cases with plants of Pteridophytic affinity shows that similar structural and developmental details are found: the most conspicuous case is that of *Danaea*, in which large synangia are found on the under-surface of the leaf; these, though attached along the leaf surface, have a structural similarity to the spike of *Ophioglossum*. It is not uncommon to find in them, as in the Angiosperms quoted, great variety of size of the loculi, and of thickness of the septa, while incomplete septa are also common: the close parallel as to these characters is a very striking feature, and raises the probability of their having resulted from a similar mode of evolutionary progress, *i.e.* by septation.

The second part of the “studies” refers to the Ophioglossaceæ, and the suggestion made by various writers (Mettenius, Strasburger, Celakovsky, and others), that they are related to the Lycopods is upheld; it is supported on grounds of comparison of external form, of anatomy, of the characters of the Gametophyte and embryology, as far as known. From these various sources a general support of the relationship has been traced, the nearest point of comparison appearing to be between *O. Bergianum*, and *Phylloglossum Drummondii*. It is contended that the external similarity of these plants, long since recognised, is not a case of mere mimicry, but of real relationship, though this probably dates from an unknown common ancestry.

Such a relationship involves the idea of septation; but it has been shown that septation of a very similar nature has taken place in the anthers of Angiosperms. *Danaea* among Pteridophytes shows very similar characters, and, finally, a minute study of development in *Ophioglossum* has elicited facts which are compatible with such a view. From simple types of *Ophioglossum* a progression may be traced to the larger and more complex species, *e.g.*, *O. palmatum*; while a somewhat parallel sequence would lead from such a plant as *Botrychium simplex* onwards to the larger, elaborate species of the genus. *Helminthostachys* appears to hold a somewhat independent position.

December 12, 1895.—“On the Formation and Structure of Dental Enamel.” By J. Leon Williams, D.D.S., L.D.S.

The special points in the formation and structure of enamel,