THURSDAY, DECEMBER 3, 1896.

THE YAKOUTI.

Description of the Ethnographical Researches of V. A. Sierochevsky. Published by the Imperial Geographical Society of Russia, and edited by Prof. N. E. Vesilofsky. Vol. i. pp. 720, with 168 sketches, portraits, and a map. (Dedicated to the memory of A. F. Middendorf).

THE district occupied by the tribes with which this volume deals, is of vast extent, embracing almost the whole north-eastern corner of Siberia, and having a superficial area of over 2,000,000 square miles, with a seaboard to the Arctic Ocean of about 3000 versts, extending from west to east, the depth from north to south being half that amount.

If a semicircle with a radius of about 1300 miles be drawn from a point where the most western arm of the Lena enters the Arctic Ocean, this region virtually embraces the whole country inhabited by the Yakouti. The periphery of this semicircle consists of mountains varying in height from 1200 to 4000 feet, which throw off very numerous outliers into the interior table-land, giving to the scenery a romantic and picturesque character.

The interior is watered by a large number of rivers, many of them of considerable volume with swift currents; of these the northern flow into the Arctic Ocean, and the southern into the Lena, which has over a thousand tributaries. This river and the Aldana are the two most important; the latter having a length of over 2000 versts. The author had special opportunities of studying this interesting region, for not only after the date of his arrival, in 1880, did he traverse it in various directions, but from 1887-1892 he occupied himself with farming, making at the same time a close study of the language, manners, and customs of the inhabitants.

As a result, we have presented to us a volume dealing comprehensively with the history, geography, physical conditions, and ethnography of the country, and giving evidence of that painstaking and minute research so often characteristic of both Russian and German writers.

How sparsely this immense region is inhabited may be inferred from the fact that the native population does not exceed 200,000, about equally divided between the two sexes, and it mostly congregates along the banks of the rivers on the southern plateau between the Lena and the Aldana, the vast interior being virtually a *terra incognita*.

The author is inclined to the opinion that the Yakouti are not of Mongolian, but of Turko-Tartar origin, and in support of this view, which is that of the people themselves, recites numerous legends and traditions, considering it a not unimportant corroboration, that within six months from their arrival Tartars are able to understand the language, which for Russians requires years of residence to learn.

The Yakouti are in a high degree a mixed race, owing to intermarriage with the Tungoose and Russian; are short of stature, their average height being 5 ft. 3 in. as against 5 ft. 7 in. for the Russian; are generally dark, having brilliant black eyes set deep in narrow orbits; thus, although they have something in common with the Mongol, yet the author considers them to bear a much closer resemblance to the Red Indian of America.

Their religion is nominally that of the orthodox Greek church; but they are intensely superstitious, having a profound faith in good and evil spirits, and considering their sick to be possessed; they also practise exorcism, and believe in the efficacy of amulets and charms.

Their system of government is primitive and patriarchal, the elders exercising unlimited control over all tribal or family disputes. Owing to their clannishness it is almost impossible for a stranger to obtain redress, and the writer affirms that were the jury system to be introduced, no Yakouti jury would ever condemn a fellow countryman. Blood feud is, however, recognised to the ninth generation, but the feud can be ended for a consideration in money or goods.

Their language is, according to Bolling and Vambëry, an independent branch of the Turko-Tartar group, having at most ten to twelve thousand words. Inflections, however, are very numerous, and these are only to be learned from a residence amongst them; but, the author adds, to perfectly understand it, one must be a Yakout.

As may readily be believed, the climate in these high latitudes is extremely cold, and the number of days that at Yakutsk are free from frost during the year, do not exceed ninety-nine, yet during this brief period cereals grow and ripen, giving favourable returns; Kuban, a hard wheat, ripening in eighty days; other wheats in seventy-seven days; rye, barley, and oats in seventy-one days. Of these they cultivate sufficient for their requirements and to interchange for manufactured products.

Commencing towards the middle of September, frost continues to the middle of May, and before October 15 the whole region is covered with a solid mantle of snow and ice, which never melts until, under the influence of south-west and westerly winds, the thaw sets in at the end of April. The temperature throughout the winter varies but little, being from -48° Celsius to -67°; and it is remarkable that the cold is more intense in the southern than in the northern zone. The climate is exceedingly dry and exhilarating; day and night temperatures are identical, and there is not sufficient wind to winnow corn or move a branch. Throughout these months nature is in her deepest sleep. The sole evidence of faunal life is that of an occasional fox or hare; but no birds wing their flight, and desolation reigns supreme. Indeed, nowhere else in the world does winter reign under such calm, undisturbed conditions.

With the approach of spring the weather becomes disturbed, and under the influence of the south-south-west and westerly winds, as if under the power of a magician's wand, summer bursts upon the land. In the figurative language of the natives, "Winter is a white ox with two horns, one of which is broken on the first Athanasius (March 5), the second on the second Athanasius (April 24), and on the third Athanasius (May 14) the whole body disappears."

The summers are very hot, so that the variations are extreme. At Yakutsk the mean winter temperature is $-54{\cdot}5$, the summer $+22{\cdot}4$; at Verchoiansk, -58 and $+28{\cdot}2$.

The country is well wooded, forests of pine, fir, and birch extending for hundreds of miles along the rivers and the tundras of the north. They occupy about 70 per cent. of the land surface, but towards the north the trees become stunted and deformed, few of them attaining a height of over 30 feet, or a diameter of 6–8 inches. So useless is the timber, that the few natives resident there are forced to import wood for their structural requirements from the south.

The author enters minutely into the social life of the people, and into their marriage customs and home life. Had the work been printed in any other language than the Russian, it would doubtless have found readers over a wide circle. W. F. H.

CHEMICAL DYNAMICS.

Studies in Chemical Dynamics. By J. H. van 't Hoff. Revised and enlarged by Dr. Ernst Cohen. Translated by Dr. Thomas Ewan. Pp. vi + 286. (Amsterdam: F. Müller and Co. London: Williams and Norgate, 1896.)

IN 1884 Prof. van 't Hoff published a small volume entitled "Études de dynamique chimique," the general purpose of which was to give an account of the course of chemical change as illustrated by experiments chiefly carried out in his own laboratory. Unfortunately for the little work, it appeared at a time immediately following the general recognition of the immense service done by its author to organic chemistry in putting forward the idea of the asymmetric carbon atom, and immediately preceding the period when he equalled his former success by propounding the theory of osmotic pressure. There can be little doubt that the extraordinary fertility of these hypotheses, and the rapid experimental progress made in their development, diverted from the "Études" the attention they deserve. The book suffered neglect even on the continent, and in this country has been little more than a name. Such neglect is all the more regrettable because the "Études" give an excellent insight into the author's manner of work. The brilliant theories with which his name is associated were no sudden inspirations, but the outcome of steady and systematic research and speculation. It is interesting to note, for example, that in the "Études" the author makes use of Pfeffer's experiments with semi-permeable membranes, in order to calculate the affinity of salts for their water of crystallisation, and has clearly before him the connection between the lowering of the vapour pressure and the pressure developed in Pfeffer's cells.

The book at present under notice is the translation of a German edition of the "Études," revised and enlarged by Dr. E. Cohen. The form of the original work has been retained, but many later experiments have been added. Notwithstanding the interest of these additions, one almost regrets that the translation is not that of the unmodified work, on account of its value as an historical document. The book is divided into four parts, entitled: (1) "The Course of Chemical Change"; (2) "The Influence of Temperature on Chemical Change"; (3) "Chemical Equilibrium"; (4) "Affinity." In each part we have a theoretical discussion of the subject, accompanied by numerous examples and applications. The experimental devices described are often extremely ingenious, and no worker in physical chemistry should neglect to make himself acquainted with them. As to the thread of reasoning which binds the various pieces of research together, it must be conceded that the student may occasionally find some difficulty in following it. The book is not altogether easy reading, and its form precludes it from ever becoming a popular text-book. But it is much more than a text-book: from it every earnest student of physical chemistry will receive both insight and inspiration.

Among the chief novelties of the new edition may be mentioned the experiments made by the author and his pupils on slow oxidation, the thermodynamical proof of the important relation $d \log K/dT = q/2T^2$, and the methods for the determination of transition temperatures. It should be added that Dr. Ewan's translation is in refreshing contrast to many of the versions of foreign works on chemistry that have recently come under our notice. J. W.

ORIENTAL WIT AND WISDOM.

The Laughable Stories collected by Mâr Gregory John Bar-Hebræus, Maphrian of the East, from A.D. 1264 *to* 1286. The Syriac text, edited with an English translation. By E. A. Wallis Budge, Litt.D. (Cantab.), F.S.A. Pp. xxvii + iv + 204 + 166. (Luzac's Semitic Text and Translation Series. Vol. i., 1897.)

THE laughable stories collected in the thirteenth century by Bar-Hebræus, the Syriac text of which, together with an English translation, has just been published by Dr. Wallis Budge, is a remarkable book in many ways. It has been the custom with many writers who have concerned themselves with the legends and history of the East, to laugh at the Syrians as a purely ecclesiastical people whose writings consisted solely of religious commentaries and pious disquisitions; Syriac literature, in fact, has been left to the theologian, and the student of folk-lore has looked elsewhere for his materials. That this was to some extent a prejudiced view to take, was evident after the publication in 1885 of "Ka-lîlah and Dimnah," by the late Mr. Keith-Falconer, and from the Syriac version of the "History of Alexander the Great," published four years later by Dr. Wallis Budge; both of these books abundantly proved, if proof were needed, that Syriac writers took an intelligent interest in the literatures of other nations, and that from the translations they made for the use of their own countrymen, much valuable evidence was to be obtained with regard to the growth and development of Eastern legends and myths. From such works as these, however, to the book before us is a far cry, for no one has hitherto suspected that in the most learned Maphrian of the East, the Jacobite Church possessed a veritable Joe Miller.

In the course of a long life devoted to the study of theology, philosophy, and history, Bar-Hebræus, besides acquiring a thorough knowledge of the writings of his own countrymen and those of the Jews, also became

acquainted with much of the literature of Arabia, Persia, India, and Greece. While so engaged, whenever he came across a story or an anecdote that struck his fancy he made a note of it, and towards the end of his life the notes he had thus collected he classified, and from them he composed the book of laughable stories which is now rendered accessible to Western readers. A few of these stories have been previously published by Adler and Morales from a MS. in the Vatican, but the whole number, 727 in all, have now been published by Dr. Budge. The MS. in the author's own possession, which he has used as the base of his text, was written by a scribe who omitted some of the stories that he considered were not edifying; but these gaps Dr. Budge has fortunately been able to supply from a MS. in the India Office, so that there is every reason to believe that we now have the work in the exact form in which it left the hands of Bar-Hebræus. In the India Office MS., though the scribe did not go so far as to omit any of the stories, a note is frequently put in the margin as to what the reader is to skip and what to read; but, as Dr. Budge points out, the Western reader will probably doubt the wisdom of the man who made the selection. Dr. Budge himself has given us the book as Bar-Hebræus wrote it, though in his translation several of the stories, for obvious reasons, have been turned into Latin.

From a scientific point of view this collection of stories is of the highest importance, for not only do they illustrate the differences exhibited by Eastern and Western ideas of wit and humour, but we also find among them many interesting variations and developments of older traditions and beliefs. "Some of the stories," Dr. Budge remarks in his introduction, "may have existed in more than one form, or they may have been told in different ways. Thus in No. ccclxxx., the scarabæus is made to say to its mother, "Whithersoever I go men spit upon me," and its mother replies, "It is because thy beauty and smell are pleasant." With this may be compared the Arabic proverb, "The beetle is a beauty in the eyes of its mother." Again, in No. ccclxxv. we have the story of the ape of the mosque and the dog, but the turn given to the story is quite different from that of the Arabic version. We may also notice, in passing, that stories told of one man by one author are told of some one quite different by Bar-Hebræus. Thus in No. iv. it is said that Socrates once saw a woman who had hanged herself, and that he remarked, "Would that all trees bore such fruit as this; but in Diogenes Laertius the saying is attributed to Diogenes the Cynic. . . ." Dr. Budge has in this manner been able to indicate the sources from which several of the stories are derived, and to trace their subsequent development; the great majority, however, are entirely new, and are not to be found in any other work at present published.

It would be impossible within the limits of a review to do justice to the book even by lengthy quotations, but some idea of its scope and of the ground it covers may, perhaps, be obtained from a brief *résumé* of the contents of the twenty chapters or headings under which Bar-Hebræus classified his stories. The first eight of these contain notable sayings by sages, philosophers, and various classes of men of different nations; then follow stories of physicians and legends attributed to them, stories of the speech of animals, of men whose dreams and divinations have come true, stories of rich and generous men, of avaricious men and misers, of workmen who followed despised handicrafts, laughable stories of actors and comedians, stories of clowns and simpletons, of lunatics and of men possessed of devils, stories of robbers and thieves, of wonderful accidents and occurrences, and finally a collection of physiognomical characteristics supposed to indicate a man's character or future actions. The chapter or section of most interest to the present writer is that dealing with dreams and divination, for in these stories we see the survivals of a complicated system of divination and sorcery that flourished in Western Asia more than 2000 years before the birth of Bar-Hebræus; in so varied a collection, however, it is probable that each reader will find something of interest for himself. In conclusion, we may add that Dr. Budge is to be congratulated on having opened up this rich field of study for all those who may be interested in ancient Oriental customs, legends, or beliefs.

OUR BOOK SHELF.

Biedermann's Electro-physiology. Translated by Frances A. Welby. Vol. i. Pp. xii + 522. (London: Macmillan and Co., Ltd., 1896.)

STUDENTS of physiology who find, as many do, their ignorance of German to be an embarrassing obstacle in their reading, ought to be grateful to Miss Welby for her skilful translation of Prof. Biedermann's "Electrophysiologie," an account of which we gave some time ago to our readers. The value of the book consists chiefly in this—that it is a faithful record of the results yielded by the researches of the last half-century in the field of inquiry to which it relates. Some parts of this field are very unfamiliar to ordinary readers; consequently the difficulty of the translator's task has been considerably increased by the circumstance that many of the words used have as yet no recognised English equivalents. In such a case a choice has to be made between the method of introducing into an English book forms of expression obviously German, and that of devising new terms, whenever they are required for the exposition of new facts or new relations. Considering that the book is likely to be freely used as a source of information by the manufacturers of text-books, who often have no leisure to read original papers, at the same time that they desire to be up to date, it is well for their sakes, and still more for the students for whose use the boiled-down product is destined, that Miss Welby has succeeded in selecting short, simple, and expressive words. What could be better, for example, than her translation of "*ueberwerthig*" and "*unterwerthig*" by "above par" and "below par," or of "*abgeleitete Stelle*" by "lead off." On the whole Miss Welby has given the sense of her author with great care and accuracy, and writes, whenever the responsibilities of translation allow it, in good style. But in thus commending her work, we do not wish it to be understood that there may not be here and there slips to be put right in the second edition—such, for example, as the rendering of the German word *Caniile* by *Canula* (*sic*) (p. 80), or of "*graphische Darstellung*" by "graphic record" (p. 370), or, in the same paragraph, of "Boussole mit möglichst leichtem Magneten" by "galvanometer with a very free magnet"; but even such small errors as these are few and far between.

Cat and Bird Stories. From the *Spectator*, with an introduction by John St. Loe Strachey. Pp. xiii + 279. (London: T. Fisher Unwin, 1896.)

STORIES of animal intelligence are interesting, and they are of value in considering the relations between habit and instinct, and the question of reasoning power, when they can be trusted. But accurate observers are few, and sentiment often causes a simple fact to be buried in anthropomorphic imaginings, so that stories have to be taken *cum grano*, and the identity of the writer must be known before their scientific value can be appraised. We must, therefore, demur to the author's remark that "the bird and other stories in the present volume . . . have a distinct scientific as well as a literary value. They are not merely good reading, but the record of important facts in Natural History." Many of the letters are, however, anonymous, and they have been reprinted without asking permission of the writers. No man of science would have the temerity to cite irresponsible anecdotes from a collection got together in this way, as evidence of animal intelligence. The stories are no doubt entertaining, but the less that is said about their scientific value the better will naturalists be pleased.

The sub-title of the volume is worth preserving. It states that to the cat and bird stories are added "sundry anecdotes of horses, donkeys, cows, apes, bears, and other animals, as well as of insects and reptiles."

Handbook of Courses open to Women in British, Continental, and Canadian Universities. Compiled for the Graduate Club of Bryn Mawr College. By Isabel Maddison, B.Sc., Ph.D., assisted by Helen W. Thomas, A.B., and Emma S. Wines, A.M. Pp. iv + 155. (New York: The Macmillan Company.)

THE need of a handbook defining the position of universities in regard to the admission of women to their courses, has been strongly felt ever since the movement for the higher education of the gentler sex began. In the volume before us the need is admirably supplied. From the book, women graduates who desire to continue their studies abroad, and students who wish to know where they can attend courses and where receive degrees, can derive all the information they require as to methods of admission, cost of living, names of professors and lecturers, &c. It will be to women what the invaluable "Minerva Jahrbuch der gelehrten Welt" is to every one desiring information on institutions for higher education.

We notice that Queen's College, London, is omitted (though it has a charter), while King's College is included. As it is proposed to publish a new edition annually, the omission may be put right in the next issue.

Ostwald's Klassiker der Exakten Wissenschaften, Nos. 76-79. (Leipzig: Wilhelm Engelmann, 1896.)

PROF. OSTWALD'S reprints of physical classics are too well known to need recommendation. Four volumes have recently been added to the series, viz.:—

No. 76: "Theorie der doppelten Strahlenbrechung, abgeleitet aus den Gleichungen der Mechanik," by F. E. Neumann (1832), edited by A. Wangerin.

No. 77: "Über die Bildung und die Eigenschaften der Determinanten," by C. G. J. Jacobi (1841), edited by P. Stäckel.

No. 78: "Über die Functionaldeterminanten," by C. G. J. Jacobi (1841), edited by P. Stäckel.

No. 79: "Zwei hydrodynamische Abhandlungen." (1) "Über Wirbelbewegungen" (1858). (2) "Über discontinuirliche Flüssigkeitsbewegungen" (1868), by H. Helmholtz, edited by A. Wangerin.

The editorial remarks are very full in each case, and they add to the value of a unique series of republished scientific papers.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Production of X-Rays.

OBSERVERS who use Wimshurst machines should remember that part of their difficulty in obtaining X-rays with a steady current and low vacuum may lie in a peculiarity of the machine itself, viz. that it will not work well when short-circuited. Machines with permanently charged armatures do not suffer from this defect, though certainly it does appear that a given quantity delivered in jerks is optically more effective than the same quantity delivered smoothly. But this seems to be a physiological rather than a physical fact, because I do not find it true photographically. The easiest plan to get a jerky current is to use what I have elsewhere called a B-circuit—attachments to outside of jars,—and the bulb is then, as Mr. T. C. Porter says, almost objectionably brilliant. OLIVER J. LODGE.

Responsibility in Science.

UNDER the above heading, Mr. C. Chree wrote to protest against some remarks in my address to Section D of the British Association, which met recently at Liverpool. Having only just returned to England, this is my first convenient opportunity of replying to his letter, which appeared in NATURE of October 15 (p. 572).

Mr. Chree objects to the view that "physicists as a body" have accepted Lord Kelvin's and Prof. Tait's conclusions as to the age of the earth. In a matter of such great importance and interest, and one which has courted criticism for so long a time and on occasions of such exceptional prominence, it is probably fair to conclude that, with the great majority of physicists, "silence gave consent." Furthermore, many distinguished physicists have expressly told me that they could find no flaw in the case.

If Lord Kelvin and Prof. Tait express a strong opinion, if this opinion is quoted again and again, and is only criticised by geologists and zoologists, no physicist saying a word, it is likely enough that the geologist and zoologist may come to entertain an exaggerated notion of the amount of support conceded to the opinion by the whole body of physicists.

The point does not seem to me to be a very important one; and I do not imagine that "physicists as a body" will be much aggrieved because I assumed that they agreed with Lord Kelvin on this point.

Mr. Chree then proceeds to impute to me various opinions which I do not hold, and supports the imputation by finding, in my address, a "strong flavour" of views which only exist in his imagination, or by asking whether I believe some opinion which I never expressed, and which he then goes on to demolish.

Thus, I never said, or implied, or believed that "a solid is *rigid* in the mathematical sense," or that "electrical and thermal conductivity necessarily . . . vary together." I understand that Prof. Schuster's conclusion as to the high internal electric conductivity *suggests* a high thermal conductivity, and no more than this can be got out of my address; and this, I have reason to believe, is an opinion shared by Prof. Schuster himself, and probably by the majority of physicists.

The author also takes some pains to show that other forces besides the tides have influenced the rate of the earth's rotation. He might have spared himself the trouble. I was not writing a treatise on the subject, but attempting to give an account of Lord Kelvin's views, and Lord Kelvin considers the tides to be all-important in this respect. He considers and dismisses as comparatively unimportant the agencies alluded to by Mr. Chree.

The evidence from the mean density of the earth was never put forward as conclusive, but only as suggestive.

I can only account for the remark that I "might be well advised to allow for the possibility that Lord Kelvin's speculations do not possess a monopoly of physical uncertainties," on the hypothesis that Mr. Chree has not read my address carefully, or has failed to comprehend the attitude I assumed. I all along recognised the "physical uncertainties" on every side, and made no claim whatever to replace them by certainties. My whole object was to show that no certain conclusions can be reached

from physical data, and that we, the geologists and zoologists, "are free to proceed, and to look for the conclusions warranted by our own evidence."

Lord Kelvin's experiments on thermal conductivity of rock at various temperatures are of the highest interest. I did not allude to them because it seemed to me unnecessary to point out that, until we know the nature of the material which forms the deeper parts of the earth, any attempt to generalise from the results of experiments on the material of the surface must be inconclusive.

Mr. Chree thinks that I might have made something of the uncertainty as to the true mean temperature gradient at the surface. The reports of the British Association on underground temperature afford abundant support for a temperature gradient in the northern hemisphere, which cannot be very different from that selected by Lord Kelvin.

I fail to grasp the object of Mr. Chree's letter, unless it be to proclaim that he never accepted Lord Kelvin's conclusions, and I cannot see that any great object is gained by even this statement.

As I am writing on the subject, I should wish to point out that the address, as printed in the Report of the Liverpool meeting, will be slightly different from that which has appeared in the columns of NATURE. Lord Kelvin kindly drew my attention to one or two errors which will be corrected in the Report.

Oxford, November 20. EDWARD B. POULTON.

Measurements of Crabs.

I AM much obliged to Prof. Weldon and Mr. H. Thompson for the careful consideration they have given to the doubt which I raised concerning the validity of the comparison made by the latter of measurements of crabs collected from the same locality in different years. Prof. Weldon offers some evidence to show that immersion in spirit does not affect the relative dimensions of parts of the carapace. The evidence is not direct, nor perhaps is it complete. It refers to female crabs, and not to the male specimens with which Mr. Thompson was dealing. But I notice that according to Prof. Weldon's measurements the spirit specimens of 1895 differed more than the fresh specimens of 1895, from the spirit specimens of 1893, whereas if the spirit were the cause, the difference would be less between spirit specimens and spirit specimens than between spirit specimens and fresh specimens. I admit then that there is little possibility of the observed difference being due to the action of spirit.

But Mr. Thompson's letter suggests other reflections. He draws my attention to the fact that the difference which he observed between crabs of the one year and those of the other, is of precisely the same kind as the difference between an older crab and a younger crab, or rather between a larger crab and a smaller crab. As the male crab increases in size, its frontal breadth is continually becoming less in proportion to its carapace length, while its dentary margin is becoming greater. What Mr. Thompson found, therefore, was simply that in one sample the individuals of a given size were more advanced in development than those of the same size in the other sample. The development or law of growth remaining the same, the size of one sample had been reduced in comparison with that of the other. But this is not, I think, correctly described as a change in the character of the species. I find that the crabs of the same stage from the two samples differed in average length by about '5 mm., which is a very small difference. Such a difference might well be caused in the young crabs of two different seasons by a difference in abundance of food, due to meteorological differences; the crop of young crabs was finer in one season than in the other. I believe that if the lambs of two seasons were compared in the same way, differences in the rate of growth, or in the size of the individuals which had reached the same stage of development, would be found. We may say, indeed, that such differences are known to be of general occurrence. Mr. Thompson's paper suggests that a considerable change in the proportions of parts characteristic of the *species* had been observed, whereas, in point of fact, no new proportions were observed at all, but the old were found to be present in individuals of different sizes. J. T. CUNNINGHAM.

College of Surgeons, November 20.

Suggested Reef Boring at the Bermudas—and elsewhere.

MR. W. K. MORRISON'S suggestion (NATURE, November 5) of the Bermudas as a site for renewed reef-boring experiments, and for the establishment of a permanent biological observatory is well worthy of consideration. It is, at the same time, desirable to remark that the Bermuda reefs scarcely appear to possess the most favourable conditions for boring operations. As long since recorded by Dana ("Corals and Coral Islands," p. 361), the Bermuda coral rock abounds with caverns and fissures, and there would consequently be an imminent risk of negative results being obtained there, as has happened at Funafuti, through the uncontrollable infiltration of sea-water. The circumstance, also attested to by Dana, that the reef-making species of corals at the Bermudas are but few in number, and are constantly submerged to a depth of from, at least, one to four fathoms, places this island group, as a station for the especial investigation of coral-growths, at a disadvantage in comparison with many others that might be mentioned.

Much might be written in favour of the many locations on the Australian Great Barrier Reef that would be particularly suited for the prosecution of the borings and biological investigations proposed. My later sphere of investigation has brought within my notice another area which, in certain respects, offers advantages and facilities possessed by no other spot throughout the coral regions with which I am acquainted. I refer to Houtman's Abrolhos, lying thirty miles to the westward of the port of Geraldton, within a day's journey from Perth, on the coast of Western Australia. A paper indicating certain of the more remarkable marine biological features of these islands was communicated by me to last year's Ipswich meeting of the British Association, and the subject is dealt with in further detail in a chapter of my book, "The Naturalist in Australia," now on the eve of publication. The data recorded that are most pertinent to the present issue are as follows.

Notwithstanding the position of the Abrolhos islands so far south, 28° to 29°, as to be outside the limits of the tropics, the marine fauna—owing to a warm southerly drifting equatorial current—corresponds more nearly in character with that of Torres Straits than with that of the adjacent mainland coastline as far north at least as King's Sound, in latitudes 16° to 17°. The western is a perfect archipelago of coral islands, including lagoon, barrier, and fringing reefs, and abounds with readily accessible coral growths in infinite variety.

An abundant illustration of what Houtman's Abrolhos can produce is afforded among the series of coral specimens from the Western Australian reefs, recently contributed by me to the British Museum coral galleries.

Any practical scheme initiated in this country having as its object experimental reef-boring, or the establishment of a marine biological observatory on Houtman's Abrolhos, would undoubtedly receive substantial sympathy and support at the hands of the Western Australian Government collectively, and yet more definitively through the medium of its far-seeing and scientific-minded Premier, Sir John Forrest.

Any assistance towards the furtherance of this suggested scheme, should it merit consideration, that may lay within my power, would be most willingly contributed.

London, November 9. W. SAVILLE-KENT.

The Structure of Nerve Cells.

THE Spanish histologist, Dr. S. R. Cajal, on p. 9 of his book "Les nouvelles idées sur la structure du Système nerveux," translated into French by Dr. L. Azoulay, makes the following assertion:—"Les cellules nerveuses sont des unités indépendantes, ne s'anastomosant *jamais* ni par leurs rameaux protoplasmiques, ni par leurs expansions nerveuses ou cylindres axes." (The italics are mine.) I venture to bring this statement forward because recently I have discovered that it is not universally correct; in sections of the medulla oblongata of a young snake, *Tropidonotus natrix*, prepared according to Cox's modification of Golgi's corrosive sublimate process, I have found a pair of cells on the ventral edge distinctly united together by a protoplasmic process, or, as I would propose to term it, a dendrite. Cox's mercurial method is so far better than the chrom-osmium-silver method, inasmuch as the preparations made by it keep much longer. ALFRED SANDERS.

The Hawthorns, Caterham Valley, November 26.

Snow Buntings.

IT may interest some of your readers to learn that on November 17 I saw near the top of Snowdon a flock of snow buntings. The mountain was snow-clad, and had been so for several weeks. J. R. DAKYNS.

Penn-y-ywvyl, November 23.

BOOKS ON MOUNTAINS.[1]

DURING the last forty years we have had many books on Alpine climbing, as Mr. Baillie-Grohman observes, but not one on Alpine sport; for the late Charles Bonar wrote his delightful little volume on "Chamois Hunting" before the first Alpine Club was founded. That, however, dealt with a rather limited portion of the Alps, and was chiefly concerned with the chamois, though it also gave some account of stag shooting. Mr. Baillie-Grohman takes a wider range, both of space and of subject. Still, even he writes mainly, as did Mr. Bonar, of the Bavarian and Tyrolese Alps; indeed, the Graians are the only district that receives more than a casual notice. The reason for this is obvious; in the Central and Western Alps the red deer is unknown, and the chamois, as a rule, is not common. The latter, indeed, might have followed the former; for republican principles, as all the world knows, are not favourable to the preservation of game; but the Swiss authorities, whether actuated by sentiment or by an eye to the main chance, have taken steps—and with considerable success—to save this animal from extermination. But in the limestone range which lies north of the Inn, on the frontier of Bavaria and Austria, and in one or two parts in the main range of the Tyrol, there are large mountain

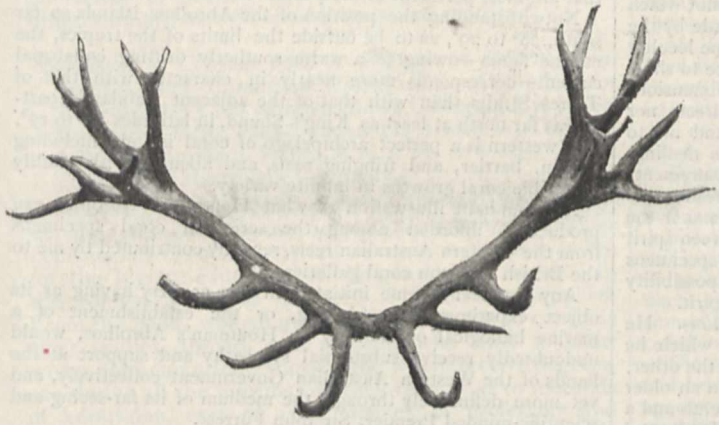


FIG. 1.—The largest Red Deer Antlers in existence.

districts which are strictly preserved by their owners. One of these districts, as Mr. Baillie-Grohman says, might be called "the Dukeries," for all its masters are at least of that rank; the finest "shoot" belonging to Saxe-Coburg-Gotha. Mr. Baillie-Grohman tells many interesting anecdotes of the late Duke, one of the keenest of sportsmen, whose shooting party he was frequently invited to join.

The book, of course, is written for sportsmen, and is to a considerable extent occupied with the author's own experiences, his successes, and disappointments; but he also gives many particulars of the chase in bygone times, which are illustrated by reproductions of some quaint old pictures. But he incidentally brings in some matter interesting to the naturalist. Mr. Baillie-Grohman of course has much to say on the horns of the quarry—the chamois, the red deer, the roe deer, and the bouquetin—and he gives details of the growth and of other peculiarities, with illustrations of horns notable for size or for singular deformities. An exceptionally large pair are represented in the annexed illustration (Fig. 1), for the use of which we are indebted to the publishers. These appendages often exhibit slight differences depending on locality. According to the author, the horns of chamois from the crystalline districts of the Alps run a little smaller than those from the calcareous; but besides this, slight differences in form are exhibited in places widely apart, and this is yet more strongly exemplified in the case of the chamois of the Alps and the izzard of the Pyrenees. The horns, also, of the Alpine stag considerably exceed in size those of the Scotch red deer. This subject is discussed at some length, Mr. Baillie-Grohman bringing forward evidence to show that the growth of the horns depends, among other circumstances, upon the food supply, and that the size of the antlers is affected in any one year by the nutriment of the stag during the period when these were growing. The Scotch antlers, he says, are comparatively small, because the food supply is insufficient and irregular; "the survival of the fittest" is not properly secured, and the improvement of the breed is neglected. The continental sportsman cares most for the antlers, the British for the venison, or simply for the number of the slain, so that the quality of the stag is deteriorating in the so-called forests of Scotland. The chase, by the way, in the Alpine regions takes place in actual forests, and the quarry is stalked during the rutting season, when the stag betrays his situation by his roar, and is forgetful of danger while on amorous thoughts intent. The roe deer is abundant in the north-eastern Alps, and is a plucky little animal; but the bouquetin or steinbock is now restricted to the Graian Alps, though formerly it ranged over every part. It finally disappeared from the Pennines about the middle of the present century, and would have been exterminated in the Graians by now had it not been taken under royal protection. This animal does not appear to have fallen to the author's bullet. For the details of all these and other matters we must refer to the book itself. It is well printed and well illustrated, full of interesting details of the chase and anecdotes of sport; it is redolent of the perfume of the forests and the clear air of the mountain peaks; it is the work of a ready writer, and of a lover of the Alps.

Dr. von Lendenfeld's work might be called a version of "The Alps from end to end," adapted to the ordinary traveller. It is neither a guide-book nor a systematic treatise, but it consists of a series of sections or short articles, describing all the most interesting and characteristic districts of that great mountain chain, from the shore of the Mediterranean to the neighbourhood of the Semmering Pass. There is no preface, so that we are not informed how far the book is the result of the author's personal experience, and how far a compilation; but if in any parts he has drawn upon the experiences of others, the tale is told so as to make them seem his own. We can vouch from personal knowledge for the accuracy of some drawings of not very accessible places, such as the sketches of certain high peaks; so that the artist, at any rate, must have been on the spot. The stories of mountain climbs, one or two of which are introduced into each article dealing with the chief Alpine centres, are suc-

[1] "Sport in the Alps in the Past and Present; an Account of the Chase of the Chamois, Red Deer, Bouquetin, Roe Deer, Capercaillie, and Black Cock, with Personal Adventures and Historical Notes, and some Sporting Reminiscences of H.R.H. the late Duke of Saxe-Coburg-Gotha." By W. A. Baillie-Grohman. With numerous illustrations and photographs from life. 1 vol. Pp. xvi + 356. (London: A. and C. Black, 1896.)

"Aus den Alpen." Von Robert von Lendenfeld. Illustriert von E. T. Compton und Paul Hey. I. Band, Die West Alpen (pp. xii + 486); II. Band, Die Ost Alpen. Pp. xii + 512. (Wien: F. Tempsky, 1896.)

"Chamonix and the Range of Mont Blanc." A Guide. By Edward Whymper. With illustrations and maps. Pp. 192. (London: John Murray, 1896.)

"Climbs in the New Zealand Alps; being an Account of Travel and Discovery." By E. A. FitzGerald, F.R.G.S. With appendices, many illustrations, and a map. Pp. xvi + 364. (London: T. Fisher Unwin, 1896.)

"Mountaineering and Exploration in the Japanese Alps." By the Rev. Walter Weston, M.A., F.R.G.S. With maps and 35 illustrations. Pp. xvi + 346. (London: John Murray, 1896.)

cinctly and pleasantly told. There is some history and some science, but not too much for the ordinary tourist. Alpine geology, of course, is not forgotten; but here, as the author has had to rely on the work of others, the statements sometimes are open to question. The following may be taken as an example: "Wie am Splügen durchsetz auch am Bernhardin die Trias das Urgebirge des Hauptkammes." But the infolds in the gneissic *massif* on these two passes are crystalline rocks, varying usually from marble to darkish calc-mica schists. They are identical with rocks which elsewhere are indubitably very much older than the Trias, and are about as unlike as they can be to any rock which can be proved to belong to this system. In fact their Triassic age is only a "pious opinion," and, like many such, has no scientific foundation. But the Swiss geological surveyors have not distinguished themselves in the district of the Hinter and Vorder Rhein.

The illustrations are numerous and varied; sketches of characteristic incidents of travel, such as scenes in an hotel, at the station of a mountain railway, in a market-place or at a *fête;* views by the wayside, groups of châlets, or bits of old architecture, churches, castles, villages, or towns. With these are numerous examples of Alpine scenery, ranging from some little wayside nook to one of the snowy giants of the chain. Many of the former are admirably done; the latter (the scenery) are more unequal. Some, such as the full-page view of the Matterhorn (by Mr. Compton), are very effective, but in others the artist has failed to catch the character of the rocks, and they are merely conventional. Another fault may be noticed, which is becoming too prominent in modern sketches—namely, a tricky disposal of the lights and shadows, which produces a "splashy" effect, and an exaggeration of the features of the scenery, so that nature is caricatured rather than depicted. Still, though the style which illustrated journals have fostered is occasionally too prominent, the pictures are remarkably good, and exceed in quantity and quality what we should get in a book of similar price "made in England." It forms a very agreeable souvenir of the Alps, for its pages will recall pleasant memories to every tourist. So attractive indeed is it, both in illustrations and in text, that we hope the publishers will have it translated, for an English edition ought to find many purchasers in this country.

In his book on Chamonix Mr. Whymper has endeavoured, as he says, "to give in a small compass information which some may desire to have at home, and that others will wish for on the spot." Thus, while it contains all that is usual in a guide-book, it gives a good deal more, so that some of the chapters are very interesting reading. One, for instance, is devoted to the early history of Chamonix and Mont Blanc; the one, as we learn from the information which Mr. Whymper has obtained, can be traced back almost for eight centuries, while the other appears not to have acquired its distinctive name until the earlier part of the last century. We read in his pages the tale of the first attempts to ascend the mountain, of Jacques Balmat's success in discovering the route to the summit, of H. B. de Saussure's ascent, and of some of the more interesting of those accomplished by later travellers. Next comes a "chapter of accidents," giving a brief outline of those numerous catastrophes which associate the mountain with so many sad memories. Then follows an account of the attempts to use it for scientific purposes; and the remainder of the book is occupied by descriptions of the means of approaching Chamonix, of the modern village—or town, as now it might almost be called—of the various excursions from Chamonix or the immediate neighbourhood, both small and great, of the different routes to the summit of Mont Blanc, and, lastly, of the "tour" of the mountain. Needless to say that the book is well designed and well

FIG. 2.—The "Aiguille Verte and the Aiguille du Dru."

written, because Mr. Whymper, as we know from his larger books on the Alps and the Andes, can describe as well as he can depict. It is impossible to criticise, when the author stands almost alone in his thorough knowledge of the district. There are illustrations—one of which (Fig. 2) we are permitted to reproduce—plans, and an excellent map of the snowy range. So much is given in a short compass, that it seems greedy to ask for more; but we think that, notwithstanding the full table of contents, an index would be an improvement, and that a few paragraphs on the geology and natural history of the range might be added with advantage.

Mr. FitzGerald's book, as he states, is "a simple record of adventure," but he adds very much to our knowledge of the most interesting districts of the New Zealand Alps, the topography of which is made clear by his excellent map, founded on the latest Government Survey. The Alps of the Southern Island correspond in structure more nearly with the Pyrenees than with their European namesakes—that is, they are a single range rather than a chain consisting of a series of great parallel folds. Though the highest peak, Aorangi or Mount Cook, introduced to the notice of English climbers by the Rev. W. S. Green, attains an elevation of 12,349 feet, not many exceed 10,000 feet. The snow-line, however, is quite 2000 feet lower than it is in Switzerland, and the glaciers descend much nearer to the sea-level. On the eastern side the great Tasman glacier comes down to about 2350 feet; while on the western side, where the valleys are considerably steeper, for the watershed is much nearer that coast, the glaciers descend more than once to 1200 feet, the Fox glacier actually ending about 700 feet above the sea. Yet the mean temperature in the latitude of Mount Cook is about 52°. As the temperature of the Swiss lowland, at an elevation of some 1300 feet, is about 47°, the difference, so far as this cause goes, is not large, and the greater extension of the snow region and descent of the glaciers must be partly due to the heavier rain (or snow) fall. Probably this is something like 150 inches on the higher parts of the western slopes, or nearly double of what it is at corresponding positions in the Alps.

The mountaineer finds the peaks and glaciers of New Zealand in many respects more difficult than those of the "playground of Europe." They are not easily reached, for at present no good roads have been made in the higher valleys; the weather is most unfavourable, often persistently bad, always liable to sudden change; there is one mountain inn in the whole region; there are no châlets, practically no guides or porters. Thus the traveller must bring a guide from Europe, must be prepared to bivouac—under what discomfort readers of Mr. FitzGerald's book will learn—on the mountain side, and to carry his own "swag." "Expensive, laborious, and often disappointing," seems to be the motto of a tour in the high Alps of New Zealand. The climber also has to face considerable difficulties, and even dangers: certainly more on the average than among peaks of corresponding elevation in Switzerland. The rock, in the parts explored by Mr. FitzGerald, is bad slate or slabby greywacke, very incoherent and untrustworthy. He had many narrow escapes, and near the summit of one peak—Mount Sefton—was only saved from a fatal fall by the

FIG. 3.—Fuji-san, with cloud cap, from the South-west.

skill and strength of his guide, Mattias Zurbriggen, and by his own readiness of resource. The accident was caused by the wholly unexpected fall of a great block of stone. Notwithstanding all difficulties, Mr. FitzGerald made the ascent of four peaks hitherto unclimbed—Mount Tasman (11,475 feet), Mount Sefton (10,350 feet), Mount Haidinger (10,054 feet), and Mount Sealy (8,631 feet), and crossed three new glacier passes. One of these, though it hardly deserves the name of a glacier pass, is a discovery of importance to the colony. Till this time the great mountain wall had prevented any communication between the eastern and western coasts except by sea, so that a direct route across this barrier anywhere near the middle of the island was much desired. Mr. FitzGerald discovered a pass, which now bears his name, leading direct from one of the branches of the Tasman valley to the west coast. There is a very small glacier on the east side, and none at all on the other. It is, as he says, a pass comparable with the Monte Moro in Switzerland, and so, with some expenditure on making the track, may be easily crossed by packhorses and cattle, at any rate during the summer season. His own experience was the reverse of agreeable. Preliminary explorations with Zurbriggen showed them that the eastern side presented no difficulty, and suggested that the descent on the western would be easy. So it was for a while; then they found themselves confronted with an impenetrable "scrub" at a place where the river entered a gorge. After attempting the former, they were forced to follow the latter as the less evil way. But the result was that, instead of reaching the west coast in about twenty-four hours from the starting-point, they were out for two nights and nearly three days, having taken provisions for one day only! This difficulty of course will not recur, for a road can be easily cut through the scrub. The book is well written and illustrated, though perhaps one or two of the pictures —*not* made from sketches taken on the spot—are slightly sensational. Some appendices contain details of interest as to geology and natural history. It tells unaffectedly and most attractively a tale of careful preparation, bold climbing, and wonderful endurance.

Mr. Weston, while British chaplain at Kobe, spent his holidays for four years in wandering about the mountain regions of Central Japan. Of course he was often far away from beaten tracks, and saw much of the native life in its original simplicity. His experiences are described in the brightly and pleasantly written volume before us, which also contains some curious information as to the customs and the religious beliefs of the people, demonology, the "possession" of human beings by animals, ghosts, rites of incantation, such as those for affecting the weather, and the like. He seems to have found no special difficulties in travel, and generally met with a kindly reception from this quaint and courteous people, except once or twice when impediments were caused in regard to passports, or from a belief like that which formerly kept the Swiss away from Pilatus; but he had often to rough it, for the accommodation frequently is very primitive, and food is scanty. But there is one set-off in Japanese travel, that the "honourable hot-bath," as it is politely called, is a general institution. As, however, this serves many bathers without change of the water, it is well to secure an early turn.

The backbone of the Japanese Alps consists of granitic rocks with crystalline schists, through which igneous masses have been extruded. Thus some peaks are of granite, others are of felstone or old volcanic rocks, others are cones which still retain their craters. Hence the rocks are of very different ages, and some of the older exhibit marked indications of mechanical disturbances. The higher summits seem very commonly just to overtop 10,000 feet. Thus Hodakadake, the highest granitic peak in Japan, is 10,150 feet; Yarigatake, the boldest in outline and a "brecciated porphyry," is 10,300 feet; while Fuji-san, which exceeds all the rest by 2000 feet, being 12,400 feet, is a crater. This indicates considerable difference in age, and the chain very probably is of a complex character. Mr. Gowland, who contributes a few remarks on the geology, thinks its beginning was in Palæozoic times, when it consisted chiefly of granite and schists. All the above-named peaks and sundry others were ascended by Mr. Weston, who also crossed several passes. These generally range from about 5000 to rather more than 7000 feet. In fine weather the climbing does not seem to present many serious difficulties, but the great rock slabs are apt to be slippery in wet, and the distances traversed on foot are sometimes rather great. His verdict is that while these mountains do not display the glory of glacier-shrouded peaks, and are on a scale only two-thirds of the Alps of Switzerland, they surpass anything he has met with among the latter in "the picturesqueness of their valleys and the magnificence of the dark and silent forests that clothe their massive flanks." The larger illustrations show that this praise is not exaggerated; two of the most striking represent the granitic pinnacles of Hodakadate and the singular cone of Fuji-san capped by a "bonnet cloud." For the use of the latter illustration (Fig. 3) we are indebted to the publishers. The smaller cuts also, which represent a variety of subjects, and are in several cases excellent, add to the value of this attractive work.

T. G. BONNEY.

OYSTER CULTURE IN RELATION TO DISEASE.

UNDER the above title the Medical Officer of the Local Government Board has just issued a supplement to his report for 1894-95, dealing with reports and papers on the cultivation and storage of oysters and certain other edible molluscs in relation to the occurrence of disease in man. An inquiry on this subject was bound to be instituted sooner or later. There has been an uneasy feeling for many years past that the infection of enteric or typhoid fever is at times due to the consumption of uncooked oysters; and in his report on cholera in England in 1893, Dr. Thorne Thorne expressed his conviction that the distribution of shell-fish from Cleethorpes and Grimsby, as a centre, had been concerned in the diffusion of scattered cases of cholera over a somewhat wide area of England, owing to the fact that oysters and other molluscs at these ports were so deposited and stored as to be almost necessarily bathed each tide with the effluent of sewers at that time receiving cholera discharges. In the early part of 1895, Sir William Broadbent also publicly announced his conviction that oysters were occasionally capable of transmitting the infection of typhoid fever, and the fact received startling confirmation from a report to the State Board of Health of Connecticut, U.S.A., by Prof. Conn, on an oyster epidemic of typhoid at Wesleyan University, Middletown, Connecticut, in which some twenty-six cases of that disease were indisputably traced to the consumption of raw oysters, which had the opportunity of becoming specifically contaminated by sewage delivering at the time the discharges of typhoid patients. A similar outbreak of Saint-André de Sangoins, in the Mediterranean Department of Herault, was investigated by Dr. Chantemesse, and traced to oysters received from Cette, on the coast of the same Department, where, according to a Commission subsequently appointed, the oysters had been stored in waters highly contaminated with sewage.

Under these circumstances, the Local Government Board determined to institute a searching inquiry into the conditions of oyster cultivation and storage along the coasts of England and Wales, and to cause bacteriological investigations to be made as to the power of the

oyster to absorb, retain, and transmit the typhoid bacillus and the cholera vibrio. The first part of the inquiry was entrusted to Dr. Timbrell Bulstrode, and the second portion to Dr. Klein. Their reports, which are suitably illustrated with photographs and maps, constitute the material on which Dr. Thorne Thorne bases his introductory remarks. In the appendix are given a copy of Prof. Conn's report already alluded to, and an extract from the *Proceedings* of the Académie de Médicine in Paris, relating to the spread of disease through the agency of oysters.

The value and extent of the oyster trade in this country may be gleaned from the following figures, furnished by Dr. Bulstrode. In 1894 there were landed on the English and Welsh coasts, by English dredgers, 27,747,000 oysters, valued at £84,271, the average price being per 100, 6*s.* 1*d.*, and per 1000, £3 0*s.* 10*d.* These were delivered on the several coasts as follows :—

	Oysters.		Value.
East Coast ...	16,833,000	...	£58,300
South Coast ...	4,251,000	...	11,186
West Coast ...	6,663,000	...	14,785
	27,747,000	...	84,271

These figures relate only to oysters landed by English boats employed in the home industry; in addition enormous quantities are imported from abroad, partly for relaying, and partly for more or less immediate consumption. American oysters, known as "Blue points," "East rivers," and "Sounds" are mainly received at Liverpool and Southampton, whilst the Dutch and Belgian oysters chiefly come to Grimsby and Brightlingsea. A considerable number also are received from Scotch and Irish beds.

It is generally assumed, at all events, by the more educated lovers of the bivalve, that oysters are "out of season" during such months as have not the letter "r" in their names, and as a matter of fact the "close time" for oysters, born and bred in this country, extends from May 14 to August 4—that is during the spatting season. But that portion of the community which is referred to in the report as "the less fastidious class," and which is "addicted to the practice of sea-side trips of brief duration," is addicted also to the practice of eating the oyster at any time of the year it can be got, and in the summer months, therefore, has to content itself with the imported varieties, the restriction as to "close time" not applying to oysters taken in the waters of a foreign State.

It would appear from the returns that the largest number of oysters is consumed in September; but, although the number eaten diminishes as the year draws to a close, their value steadily increases up to December, when it gradually diminishes, month after month, until it reaches a minimum in June or July.

As the result of Dr. Bulstrode's inquiries and observations, it is distinctly disquieting to be told that only a few of the oyster layings, fattening beds, or storage ponds round the English and Welsh coasts can be regarded as theoretically free from every possible chance of sewage pollution. At the same time, in the case of the majority of them, the polluting matter is mixed with so vast a bulk of water that there is little substantial risk of deleterious influence. The possible mischief is due to the circumstance that the cultivation of the oyster is mainly carried on at points on the coast which are readily accessible, and where labour can be easily obtained, or, in other words, in tidal estuaries in the neighbourhood of more or less populous places, into which, therefore, the sewage of such places is apt to be delivered. In the report, three such localities are singled out for special condemnation; viz. Southend, where, as regards one laying, "the sea-bottom and the matters floating on the surface, afford the most obvious proof that the conditions are filthy in the extreme"; at Cleethorpes, where the layings are exposed to the influence of sewer outfalls, serving (counting that of Grimsby) populations of about 67,000; and the Medina, in the Isle of Wight, of which it is stated that "it seems almost beyond comprehension how any one could venture to 'fatten' oysters for human consumption in a river estuary such as this, which is fouled above the layings by the crude sewage of Newport, with its 10,000 inhabitants, by the effluent from the neighbouring prison and barracks, and by the overflow from the workhouse cesspool; and which receives into it immediately below the layings the contents of eight other sewer and drain outfalls from East Cowes and West Cowes." It is further pointed out that "the layings in the Penryn River, Cornwall, and those in Brightlingsea Creek, in Essex, also call for especial notice in connection with the obvious risk of sewage pollution. At Brightlingsea this risk has more than once been drawn attention to by the local health officer. The layings in the South Channel, off Southwick, near Shoreham, are similarly exposed to sewage; and in a minor degree, on account of the great bulk of water there in question, such layings as those in the Menai Straits come under suspicion. From most, if not all, of these layings, oysters are despatched direct to market."

On the other hand, some of the most celebrated layings on the coast of Essex and Kent—as in the Crouch, Roach and Blackwater, and off the Swale—are practically free from risk, although the layings in the bed of the Colne which presumably furnish the supplies for the time-honoured "Colchester feast," are subjected to the comparatively concentrated effluent of Colchester sewage at low water, and to the additional pollution to which the river is subjected at Wivenhoe and Rowhedge.

The conditions under which the oysters are stored in beds, ponds, or pits, pending despatch to market, naturally received close attention. The layings or "fattening" places might be everything that could be desired, but the oysters, when lifted, might still be stored in a most objectionable manner. The boxes off Southend Pier, for example, float in what is practically dilute sewage. A set of storage pits at the mouth of the Blackwater was found to be within forty-three yards of the point at which the drainage of twenty houses is discharged. At Wivenhoe "it is impossible to see how the oysters there stored in pits can escape contamination by sewage." The means for the storage of oysters in the Fish Dock at Grimsby, are stated to be particularly offensive and dangerous. "It would be difficult to find much worse conditions than those under which certain storage pits are placed at Poole." . . . "At Warsash, above the junction of the Hamble River with Southampton Water, a sewer was found opening out just between two oyster ponds. Again at Emsworth, near Havant, a sewer and certain drain outfalls have been conveyed into the middle of a group of oyster pits, and matters are little better at Bosham."

On the other hand, the methods of storage on the Crouch and Roach, and for the most part also of the Blackwater, leave little to be desired, and the same may be said of the layings and means of storage in the Helford River in Cornwall, and at Newtown Estuary in the Isle of Wight.

To judge, however, from the frequency of instances to the contrary, it would almost seem that the cultivators were under the belief that the oyster actually enjoys himself and waxes fat in insanitary surroundings. Precisely the opposite is the case. No one enjoys the confidence of the oyster to a greater extent than Prof. Herdman, or is better able to appreciate his innermost sentiments; and we gather from Prof. Herdman's recent work that the oyster—especially the British-born-and-bred oyster—is, in reality, a cleanly, self-respecting mollusc, with an appetite not less dainty or fastidious than that of the epicure for whose gustatory pleasure he

is supposed to live. Indeed, if oysters in general had only the locomotive powers of their brethren in the classical legend of the Walrus and the Carpenter, there is very little doubt that, in many cases, they would quickly move off in search of quarters more salubrious than those in which they are often compelled to exist.

It is not easy to indicate how the present condition of things may best be remedied. Oysters, of course, are not a necessity, unless to the hardly-driven brain worker, to persons of feeble digestion, or to convalescents. Unless something is done, therefore, to reassure the public mind—either by the collective action of the oyster breeders themselves, or by systematic inspection on the part of the State—the future of the industry will be seriously jeopardised. As it is, the "scare" has done very great damage to the trade, and the good and the bad alike have indiscriminately suffered. To the statesman who is concerned with the welfare of a littoral population from which the *personnel* of our navy and coast defences is largely recruited, the problem has even a wider and deeper significance. On every ground, therefore, the question calls for prompt remedial action.

At the conclusion of his report Dr. Bulstrode makes some reference to "green-bearded" or "green-finned" oysters. These oysters find but little favour in this country, although, as is well-known, they are much appreciated in France, and the "huîtres vertes" or "huîtres de Marennes" obtain a far higher price in the Paris market than the "huîtres blanches." This green colour, which is met with to a small extent in certain Essex oysters, has been the subject of repeated investigation during the last seventy years, notably by Gaillon (1820), Valenciennes (1841), and Puségur and Decaisne (1877). The last-named observers found that the green tint was due to the inclusion of a diatom—*Navicula ostrearia*, or, as it is now called, *N. fusiformis*, taken up from the "claires" in which the oysters are confined. These observations were confirmed and extended, in 1885, by Prof. Ray Lankester, who showed that a blue pigment, which he termed "Marennin" occurs in the *Navicula*, and is either "uniformly diffused throughout the cell protoplasm," or "confined to the ends of the elongated cell body" (Bulstrode). In the oyster the green colouring matter is localised on the surface of the gills and labial palps in "certain peculiar cells of the superficial epithelium." It is the deposition of this blue pigment (Marennin) in the yellowish brown gills which, according to Prof. Lankester, gives rise to the green appearance of the "huîtres de Marennes."

It has been often alleged that this greenness is due to copper, and as a matter of fact copper has frequently been detected in oysters since Bizio, in 1835, first discovered it in the organic substance of the mollusc. Dr. Bulstrode, from time to time, sent the writer of this notice oysters from different localities, and copper was uniformly found in them, although in the Marennes oysters it was present in minute amount only—far less, indeed, than in certain oysters of a normal colour. But there is no question that the greenness of certain oysters, especially of those found in Falmouth and Truro waters, is due to copper. The colour, both in character and distribution, is, however, quite different from that of the Marennes oyster. The green Cornish oyster is unsaleable in this country—at least for immediate consumption—as it leaves a distinct metallic taste in the mouth, similar, it is said, to that due to "sucking a penny." Dr. Bulstrode caused a number of such oysters to be sent to me at different times. On incineration under conditions which precluded the possibility of the introduction of copper, there was no difficulty in detecting the presence of that metal in the ash. Indeed, here and there in the ash were particles of Alexandrine or Egyptian blue, which, as Davy found long ago, is a *frit*, made by heating together soda, lime, sand, and copper. The amount of copper, on the average, was not more than about 0·02 grain per oyster, but as it is obviously caused by the mechanical retention of cupriferous particles, individual oysters might, and indeed did, contain large quantities. On examining the mud of the locality in which such green oysters occur, it was found to contain 0·148 per cent. of copper. On relaying, the green Cornish oyster gradually loses its colour, and also its metallic taste; specimens of such relaid oysters were found to contain only 0·0060 grains of copper per oyster, which is practically the same (viz. 0·062 grain), as that found in Whitstable oysters which had never been green. This amount would seem, therefore, to be normal to the oyster, and to be probably due to the presence of hæmocyanin, first found by Fredericq in the blood of the octopus, and since shown to be present also in many mollusca.

T. E. THORPE.

NOTES.

FOR the last three or four years we have been treated in the copy of the *Times* appearing after the Anniversary Meeting of the Royal Society, to strictures of the action of the Council of that body. We have not thought it necessary to reply to these at length, because their origin was pretty well known, and the Royal Society is quite capable of taking care of itself. But this year we think the bounds of journalistic decorum have been passed in a leading article in which the regretted retirement of Lord Rayleigh from the Secretaryship is referred to. The *Times* states: "He has taken, . . . the unusual step of declining to sit on the Council, and no one who knows the play of forces within the Society can doubt that his refusal is significant." This sentence is obviously intended to suggest that Lord Rayleigh's resignation of the position which he has so long adorned, and in which his services have been so greatly valued, is due to a want of sympathy with his colleagues or to a want of respect for them. Lord Rayleigh is absent from England, but we believe that we know enough of the Royal Society and of Lord Rayleigh to warrant us in repelling at once, and, in his absence, the insinuation as unfounded, and as quite unworthy of the journal in which it has been allowed to appear.

AT the Royal Society's meeting, last week, the following were elected Foreign Members of the Society:—Prof. Albert Heim, of Zürich, geologist; Prof. Gabriel Lippmann, of Paris, physicist; Prof. Gösta Mittag-Leffler, of Stockholm, mathematician; and Prof. Giovanni Schiaparelli, Director of the Royal Astronomical Observatory of Brera, Milan.

WE announced some time ago the lamentable death of M. Tisserand, the distinguished Director of the Paris Observatory. The French Government, according to the invariable rule, at once applied to the Academy of Sciences, to nominate two men whom they considered qualified to succeed him. They selected M. Loewy and M. Callandreau, the first place being given to M. Loewy, a fully-trained astronomer, who has made his reputation along many lines of research, and who has for many years belonged to the staff of the Observatory. We learn that the Government has accepted this nomination, and that M. Loewy has been appointed Director in succession to M. Tisserand.

LORD RAYLEIGH and Prof. Ramsay have been elected Corresponding Members of the Berlin Academy of Sciences.

M. MICHEL LÉVY has been elected a member of the Section de Minéralogie of the Paris Academy of Sciences, in succession to the late M. Daubrée.

WE notice with much regret the announcement of the death of Dr. Benjamin A. Gould, the distinguished founder and editor of the *Astronomical Journal*.

DR. GILBERT W. CHILD, Lecturer on Botany in the Medical School of St. George's Hospital, and Public Examiner in the School of Natural Science, as well as for the M.D. degree at Oxford, died on Tuesday. The death is also announced of Mr. William Francis Ainsworth, known for his travels and researches in Asia Minor, Mesopotamia, &c.

THE new aquarium of New York City, in Castle Garden Building, of which mention was made in NATURE several months ago, will be opened to the public on December 15. The opening was delayed by the elaborate work of reconstructing the building.

THE total expense of the British Association meeting at Liverpool, defrayed from the local fund, was (it appears from the final report of the Local Committee) 2625*l*. The balance in the Treasurer's hands is about 980*l*., which the Committee has decided shall be invested, and the income therefrom paid to the Liverpool Marine Biology Committee, for use in the publication of *Proceedings* and the prosecution of scientific research. This action ensures that the meeting will have a lasting effect upon local scientific research, as the fund will be made a trust, and the income only used annually in the Liverpool Marine Biology Committee's investigations.

WE learn that the work on the "Ancient Volcanoes of Britain," upon which Sir Archibald Geikie has been engaged for some years, is now all in type. It will form two large octavo volumes, and will be copiously illustrated. Among the illustrations are numerous reproductions of photographs, also of sketches by the author, representing the more interesting or important features in the old volcanoes of this country from the earliest geological periods to the last great eruptions in older Tertiary time. The work will be further accompanied by a series of maps showing the distribution of the volcanic rocks of each eruptive period. It will be published by Messrs. Macmillan and Co., and will probably appear early next year.

AT the fourth Congrès international de Zoology, to be held at Cambridge in September 1898, under the presidency of Sir William Flower, the prize of the Tsar Alexander III. will be awarded for the first time, and that of the Tsar Nicholas II. will be awarded for the second time. The subject to be treated in papers competing for the former prize is "The Ruminants of Central Asia, from the zoological and geographical point of view," and the latter prize will be for "An Anatomical and Zoological Monograph of a Group of Marine Invertebrates." The prizes consist either of a sum of money or a medal of equal value, at the choice of the successful competitors. Memoirs must be sent to the President of the Permanent Committee before May 1, 1898. All zoologists are eligible to compete, except those belonging to the country in which the Congress will be held. British zoologists are thus excluded.

THE British Chamber of Commerce at Alexandria have come to the unanimous conclusion that the adoption of the metric weights and measures in the United Kingdom would be of advantage to British traders in Egypt. Lord Cromer, in forwarding the report to the Foreign Office, remarks that a very general opinion undoubtedly exists in Egypt that British trade with that country would benefit by the adoption of the metric system of weights and measures, and adds that the compulsory introduction of the metric system was strongly urged upon the Egyptian Government some years ago, when it was held that so brusque a change was to be deprecated. On the Egyptian railways, however, and in fact wherever there are Government weighing machines, the metric system has been adopted, and it is hoped that it will thus gradually take root throughout Egypt.

WE learn from the *British Medical Journal* that, on the suggestion of Dr. Nicholson, Professor of Natural History at the University of Aberdeen, the Town Council of Aberdeen agreed some time ago to utilise part of the buildings of the old bathing station as a marine aquarium. The tanks have been made, and the further necessary fittings are in hand. In view of the great importance of the fishing trade at Aberdeen, further developments have been contemplated with regard to combining a department for fish hatching and culture on a scientific basis with the aquarium. It is to be expected that the investigations carried on in such an institution should prove of great interest and importance to the students of zoology at the University.

THE juvenile lectures at the Society of Arts will this year be given by Mr. Clinton T. Dent, past president of the Alpine Club. Mr. Dent has taken for his subject "The Growth and Demolition of Mountains." The lectures will deal mainly with the destructive agencies, weather, frost, glacier movements, avalanches, waterfalls, floods, &c. They will be delivered on January 6 and 13.

AN advertisement inviting applications for the position of Macleay Bacteriologist to the Linnean Society of New South Wales, Sydney, has lately appeared in NATURE. It may be of interest to state that the salary attached to the post arises from a sum of £12,000 bequeathed by Mr. William Macleay, whose total benefactions to science in New South Wales amounted to about £100,000. In making the appointment the object in view is entirely the advancement of natural knowledge by research, the Linnean Society not deriving any pecuniary benefit therefrom.

M. A. A. L. TRÉCUL, whose death, at the age of seventy-eight, we announced on November 5 (p. 11), was one of the highest authorities on vegetable organogeny. In addition to a monograph of the Artocarpaceæ, he had contributed, during a period extending over half a century, a very large number of papers on various points in the anatomy of plants to the French botanical journals. Among the subjects thus treated of are adventitious roots and buds; the increase in diameter of woody dicotyledons; the origin and development of the fibres of the xylem and phloem; the theory of the graft; the formation of leaves; secondary formations in vegetable cells; laticiferous vessels, &c. His latest observations, contributed to the *Comptes rendus* of the French Academy, were on the ultimate ramifications of the vascular bundles in leaves and petals.

ON Friday last, at a meeting of the full Committee formed to establish an international submarine telegraph memorial, the report of the Executive Committee was received and adopted. The following are the resolutions: (1) That a bust of the late Sir John Pender, at a cost not to exceed 500*l*., be erected in the Imperial Institute or other suitable place; (2) that a sum of not less than 5000*l*. be placed in trust with the Council of University College, London, to form an endowment fund for the maintenance of the electrical laboratory in that College, on the condition that the Council name the laboratory the "Pender Laboratory," and the existing chair of Electrical Engineering the "Pender Chair of Electrical Engineering"; (3) to endow a scholarship, or a scholarship and medal, in connection with electricity at Glasgow. The Lord Provost of Edinburgh desired the word "Edinburgh" substituted for "Glasgow" in the third resolution. This was not done, but the Chairman (the

Marquis of Tweeddale) said, if the funds permitted, the claims of Edinburgh would probably be considered by the Committee. Subscriptions will be invited to carry out these resolutions.

DR. BAUMANN, whose death we announced last week, was professor of medical chemistry at the University of Freiburg in Baden. He was (says the *Lancet*) the son of a chemist, and served the full period of a pharmaceutical apprenticeship, after which he entered the Technical College of Stuttgart in order to complete his studies in chemistry, physics, and natural science. In Tübingen, where he went to take his diploma, the celebrated physiologist, Hoppe-Seyler, recognised the great talent of the young man, and not only made him his assistant, but when Prof. Hoppe-Seyler had been elected to the professorship at the University of Strassburg in Alsace, in 1872, Baumann accompanied him thither. In 1879 he was made director of the chemical department of the new Physiological Institute of Berlin, and in 1882 he became ordinary professor of medical chemistry in Freiburg, where he remained till his death on November 2. Prof. Baumann's work included researches on the subject of metabolism and on cystin. He was the discoverer of the specific action of sulphonal and trional, and also of the presence of iodine in the thyroid gland, this last being one of his latest and most notable achievements. He was only forty-nine years of age at the time of his death.

MR. S. STAINER sends us a further communication on his observations of swallows at Southampton, up to the end of November. He saw these birds on twelve separate days, from November 6 to November 25, the highest number (ten) occurring on November 12, and the lowest (one) on November 25. The weather for the first three weeks of last month was very mild, and it is suggested that during that period the insects upon which swallows feed were present in the air. The east wind, which prevailed during the last week of the month, may have so reduced the food supply as to force migration upon the birds.

AT the Royal Societies Club on Monday, Dr. John Murray, F.R.S., editor of the "*Challenger* Reports" and naturalist on the expedition, was presented by the contributors to the various sectional reports, with an album containing their portraits. The album is a very handsome volume bound in morocco, with illuminated address and dedication plate designed by Mr. Walter Crane. It contains eighty-six portraits. The *motif* of the design adopted for the cover is deep-sea and other animals collected by the expedition. The chair was taken by Sir Clements Markham, K.C.B., F.R.S. (President of the Club), and the presentation made by the Rev. T. R. R. Stebbing, F.R.S.

ALL who have attempted to determine a miscellaneous collection of fossils from any geological formation have soon discovered the difficulty of affixing correct names to all the specimens, and if they have been doing this work with the object of publishing some paper, either dealing with the stratigraphy of a district, or attempting to correlate geological horizons in different parts of the world, they have probably given the task up in despair. A few, no doubt, have been fortunate in possessing friends, whose knowledge of particular groups of fossils could be drawn upon. But it is not always that one knows the best person to apply to, or that one can be certain of a favourable reception. *Natural Science*, in its December number, has published a list of twenty-six specialists who are willing to determine various groups of fossils from various strata, when requested to do so for purposes of publication, and this enterprising action will doubtless be welcomed by many local geologists. We hope that this list is only a first instalment, for there certainly appears to be a large number of groups of fossils in which no one is prepared to pose as an authority. We should have thought that some one might have been found for the trilobites, the belemnites, or the palæozoic brachiopods. Obviously, if any one wishes to take up the study of some special division of palæontology, he need not be deterred by the lack of an opening.

THERE has recently been launched in France a novel kind of vessel, named the *Ernest Bazin*, after the name of the inventor. This vessel, which is only a large model, is intended to demonstrate the feasibility of driving steamers through the water at high speeds without increasing the engine power, and consequently the quantity of coal required beyond practical mercantile limits. The inventor considers that it is possible, with vessels designed on his principle, measuring between 400 and 500 feet in length, to realise, with a consumption of 800 tons of coal, a speed of thirty knots, which means that the voyage from this country to America could be accomplished in 100 hours. As a comparison with this, vessels of the type of the *Campania* use between 3000 and 4000 tons of coal to attain a speed of twenty-two knots, and if this speed were increased to thirty knots, there would be required for each voyage 70,000 tons. This result is to be attained by constructing the vessel on a series of large hollow wheels or rollers, which are to be made to revolve. In the model there are three rollers on each side, the vessel itself being carried on a framework resting on the axles of the rollers. The rolling motion of these wheels offers much less resistance in displacing the water than the propulsion of a fixed body through it. The rotation of the floating wheels has the effect of transforming fixed into moving elements, each point of which flies before the resistance of the water in proportion to the advance of the float, the resistance consequently becoming lessened. By experiments, M. Bazin has shown with small models that when a vessel, designed on his principle, is moved through the water with the rollers fixed, it will be brought up by an object of sufficient size floating on the water coming in contact with the rollers. Whereas, when the rollers are made to revolve, it will pass over the obstacle without loss of speed, the obstruction sinking in the water and returning to the surface after the roller has passed. The possibility of building a roller-ship has been practically demonstrated. It remains yet to be seen what the effect will be as to speed and other conditions.

IT is a popular idea that the seeds of many plants pass unharmed through the digestive canal of birds, and, being voided with the excrements, reach the ground in a peculiarly favourable condition for germination; and this is generally believed to be especially the case with the mistletoe, the seeds, in this case, being deposited on the branches of the tree on which the mistletoe is parasitic. In a paper contributed to the *Transactions* of the Linnean Society, Mr. F. W. Keeble shows that this is at all events not universally the case with the *Loranthaceæ*, especially with the Cingalese species of *Loranthus*. The species of this genus with tubular flowers which are natives of Ceylon are ornithophilous, the bird most effective in their pollination being a honey-bird, a species of *Nectarinia*. In the large-flowered species, the buds remain closed; but, when tapped, the corolla-lobes fly open with an explosion, and the pollen is scattered. The closing of the flower-buds appears to serve the purpose of protecting the pollen against rain, while the violent expulsion of the pollen aids in its carriage by the visiting birds, their beaks being frequently found to be covered with pollen after visiting the flowers. When the fruit is ripe, the bird eats the succulent portion only, wiping out the seeds with its beak on to a branch of the tree, to which they thus become attached by their viscid coating. If swallowed, the seeds are found to be digested and destroyed.

A VALUABLE memoir by Prof. Augusto Righi, entitled "Sulla propagazione dell' elettricitá nei gas attraversati dai raggi di Röntgen," has just been published by Signori Gamberini é Parmeggiani, Bologna. Practically all the experimental work which has advanced the knowledge of Röntgen rays is brought together and coordinated in the memoir, full references to the original papers being given in each case.

THE Cambridge University Press is about to issue a "Manual and Dictionary of the Phanerogams and Ferns," by Mr. J. C. Willis, Director of the Royal Botanic Gardens, Ceylon. The work is in two volumes, printed on thin paper, the second of which can be placed in the pocket as a handbook for ready reference in a botanic garden or museum. The first volume serves as an introduction to the second or dictionary part, and deals with the vegetable morphology, variation, and the principles of classification in a decidedly original manner. It considers plants largely from a biological standpoint, and attempts to indicate the effects of the environment on the organisms.

THE *Annales* of the French Meteorological Office for 1894 have recently been published. They consist of three large quarto volumes: (1) Memoirs, containing a discussion of tracks of thunderstorms, magnetic observations at various places, with a summary of the principal disturbances, and a comparison of the curves with those furnished by the registration of earth-currents, showing the relation which exists between these phenomena; a discussion of the observations made on the Eiffel Tower, &c. (2) Observations made at French stations and in their colonies. (3) Rainfall values: the number of these stations is 2039, which exceeds those given in any previous year.

CHEMICAL papers abound in the volume of *Proceedings* (vol. xxiii. new series, 1895-96) just issued by the American Academy of Arts and Sciences. We select for special mention the following subjects of contributions to the volume:—The composition of the Ohio and Canadian sulphur petroleums, by Charles F. Mabery; the chemical potential of the metals, by Wilder D. Bancroft. Among the conclusions are: (1) The potential difference between a metal and an electrolyte is not a function of the concentration of the salt solution, nor of the nature of the positive ion, except in certain special cases. (2) It is a function of the electrode, of the negative ion, and of the solvent; a revision of the atomic weight of zinc, by T. W. Richards and E. F. Rogers; (with O = 16 the atomic weight found is 65·404; with O = 15·96, the value is 65·240; and for O = 15·88, it is 64·912); thermo-electric interpolation formulæ, by Silas W. Holman; melting points of aluminium (660°), silver (970°), gold (1072°), copper (1095°), and platinum (1760°), by S. W. Holman, R. R. Lawrence, and L. Barr. The melting point of gold was assumed by the observers, and upon it the other values more or less depend. There are also papers on the thermal conductivity of mild steel, the outline of Cape Cod, and the embryology of the star-fish.

ALL chemists will welcome the appearance of a new instalment (part 2 of vol. ii.) of the "Lehrbuch du Organischen Chemie," by V. Meyer and P. Jacobson, which has just been issued. The new part deals with the aromatic phenols, quinones, aldelydes, ketones, and carboxylic acids. With the next part, the second volume, which deals with the chemistry of carbon rings, will be completed.

MR. CROOKES has been experimenting with a solution of ucium nitrate, and a larger quantity of precipitated oxalate, both supplied by M. P. Barrière, the patentee of the alleged new element, lucium. In the *Chemical News* he describes his experiments, and states that the results have convinced him that the claim of lucium to form one of the chemical elements is not justified. Chemical examination confirms the results obtained by spectrum observations, that lucium is nothing but impure yttrium.

IN the current number of the *Zeitschrift für Physikalische Chemie*, H. Euler gives the results of a series of measurements of the electrolytic dissociation of some organic acids at different temperatures. On warming a solution of benzoic acid the ionisation—*i.e.* the fraction existing in the form of ions—increases until 35° C. is reached, after which it decreases, showing that the heat evolved by the change of the undissociated molecule into the ionic condition is negative at temperatures lower than 35°, and positive at higher temperatures. *m*-Oxybenzoic acid also has a maximum ionisation between 25° and 30°. In general the ionisation either increases or decreases continuously as the temperature is raised. These results are of interest in view of the belief, which is not unfrequently met with, that the ionisation necessarily increases with rise of temperature.

THE additions to the Zoological Society's Gardens during the past week include a Leopard (*Felis pardus*, ♀) from Ceylon, presented by Surgeon-Major N. Manders; two Tigers (*Felis tigris*, ♂ ♂) from India, presented by Captain Alex. W. Thornycroft, Royal Scots Fusiliers; a Malabar Squirrel (*Sciurus maximus*) from India, presented by Mr. G. W. Vidal; a Ring-tailed Coati (*Nasua rufa*), a —— Courlau (*Aramus*, sp. inc.), a King Vulture (*Gypagus papa*), three Violaceous Night Herons (*Nycticorax violaceus*) from South America, an Impeyan Monaul (*Lophophorus impeyanus*) from the Himalaya Mountains, purchased.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS FOR COMET PERRINE.—The following positions for Perrine's comet have been computed by Otto Knopf, and are given in *Edinburgh Circular*, No. 51:—

Ephemeris for Berlin Midnight.

1896.	R.A. h. m. s.	Decl. ° ′	Brightness.
Dec. 4 ...	19 52 8 ...	+4 42·7 ...	0·99
5 ...	19 51 49 ...	4 14·7	
6 ...	19 51 31 ...	3 47·2 ...	1·00
7 ...	19 51 14 ...	3 20·2	
8 ...	19 50 59 ...	2 53·6	
9 ...	19 50 44 ...	2 27·5	
10 ...	19 50 31 ...	2 1·8 ...	1·01
11 ...	19 50 19 ...	1 36·5	
12 ...	19 50 7 ...	1 11·6	
13 ...	19 49 57 ...	0 47·1	
14 ...	19 49 47 ...	+0 23·0 ...	1·04

The brightness of this comet on November 2 has been taken as unity.

"THE ASTROPHYSICAL JOURNAL."—Among the articles in this journal for the present month may be noted Mr. W. J. Humphrey's further study of the effect of wave-lengths of lines in the arc spectra of certain elements. In this investigation he has examined the lines of several other elements, the best out of one hundred and seventy-five negatives having been employed. The new facts thus gleaned have necessitated a modification of his previous statement concerning the connection between the atomic weights and the shift of the lines. Prof. J. Fényi communicates a statement with two diagrams of the positions of the prominences on the solar limb at the time of the recent eclipse on August 8. Mr. Alexander Roberts, commenting on the growing importance of the value of the light ratio, adds some notes on a method of determining this quantity. Mr. Wadsworth, in continuation of the series of articles that has been given on "The Modern Spectroscope," describes an ingenious fluid prism without solid walls, and its use in an objective spectroscope. The general idea of the arrangement may be summarised quite briefly. A Littrow spectroscope has its axis of rotation arranged horizontally. The collimating beam from the slit falls on a free horizontal surface of a liquid contained in a glass or metal cell, and is there refracted. A mirror, also movable about the same axis, is immersed in the liquid at such an angle that it receives

the refracted ray normally, and reflects it back again to the observing telescope. This form of liquid prism is well adapted "for use in an astronomical spectroscope of either the compound or the objective type in connection with a polar heliostat, . . . the heliostat is arranged to send the beam down the polar axis instead of up, as is usually done." The author suggests that the instrument must be mounted so as to be entirely free from any vibration. Prof. Rowland continues his valuable tables of solar spectrum, wave-lengths extending here from 3133 to 3259. Prof. B. Hasselberg's researches on the spectra of metals are translated from the original, the metals here dealt with being cobalt and nickel. The author points out the great difficulty of eliminating impurities, and states that the iron spectrum of Kaiser and Runge is to a large extent contaminated with foreign lines, which fact has led him to make iron comparisons from his own photographs. The number of lines having the same position in the spectra of cobalt and nickel is found to be very great. We may mention also that two excellent photographs, showing the erection of the polar axis and declination axis of the Yerkes telescope, together

Erecting the declination axis of the Yerkes 40-inch refractor.

with a general view of the Observatory, are also given in this number.

The accompanying illustration is a reduced reproduction of the second of these photographs, and it gives a good idea of the immense scale of the undertaking.

PLANETARY NOTES.—M. Flammarion reports in a telegram, dated November 21 from Juvisy, that the observations of Mars made there show the doubling of the canals Cyclops, Cerbere, Galaxias, Brontes, Orcus and Euphrates (*Astr. Nach.*, No. 3387).

Herr Leo Brenner has also been making some interesting observations on the planets Uranus and Mercury, which he has communicated to the same number. As regards the first of these bodies, he has with his 7-inch Reinfelder refractor observed on twelve evenings (April 28 to July 9), and made the same number of drawings. The spots on the disc are, as he says, the dimmest he has ever seen on a planet's disc, but nevertheless he has made a rough determination of the planet's time of rotation, the deduced value being about eight hours. The planet was also noticed as being flattened at the poles, thus corroborating previous observations.

The observations of Mercury, which are illustrated by twenty drawings, indicate a comparatively greater amount of detail than one would expect. The drawings show that the movements of the surface markings are really the result of rotation, the value of this latter being about thirty-three to thirty-five hours. Herr Brenner says with regard to the longer period suggested by Schiaparelli, that "so far, I am perfectly certain that a rotation of about three months is quite out of the question." The drawings, he further remarks, indicate on single days distinct forward motions of the spots, the different appearances of the planet's disc at various times, the undoubted polar spots, and, further, the circumstance that the markings seen by him do not always assume the same positions as those seen by Schiaparelli and recorded on his chart. There seems, however, to be evidence that in some cases the spots seen by both observers are permanent markings, as is shown by a comparison of these drawings with Schiaparelli's map of 1890. Herr Brenner has also examined Prof. Vogel's drawings of Mercury, which, he finds, prove the accuracy of his (Brenner's) observations, and suggest the impossibility of a slow rotation.

A COMPANION TO θ-SCORPII.—Dr. T. J. J. See, with the help of the Arizona atmosphere and the 24-inch Clark refractor of the Lowell Observatory, has been able to discover that θ-Scorpii is attended by a faint satellite of the 13th magnitude (*Astr. Nach.*, No. 3387). In contrast to the reddish light of the primary, the companion appears of a greenish hue, making the system resemble Antares. The position of θ for 1900 will be R.A. 17h. 30m. 8·1s., Decl. = −42° 54′ 1·5″. The discovery was made when the star was less than 12° in altitude, which speaks well for the position of the observatory.

THE ANNIVERSARY MEETING OF THE ROYAL SOCIETY.

LAST Monday was St. Andrew's Day, and, in accordance with the usual custom, the Anniversary Meeting of the Royal Society was held in the apartments of the Society at Burlington House. The auditors of the Treasurer's accounts having read their report, and the Secretary having read the list of Fellows elected and deceased since the last Anniversary, the President (Sir Joseph Lister) delivered the following address:—

Nineteen Fellows and four Foreign Members have been taken from the Royal Society by death since the last Anniversary Meeting.

The deceased Fellows are:—

John Russell Hind, December 23, 1895, aged 73.

The Right Hon. Hugh Culling Eardley Childers, January 29, 1896, aged 69.

General James Thomas Walker, February 16, 1896, aged 69.

Charles Chambers, March, 1896, aged 61.

William Sharp, April 10, 1896, aged 91.

Sir John Russell Reynolds, May 29, 1896, aged 68.

Sir George Johnson, June 3, 1896, aged 78.

Sir Joseph Prestwich, June 23, 1896, aged 84.

The Right Hon. Sir William Robert Grove, August 2, 1896, aged 85.

Alexander Henry Green, August 19, 1896, aged 64.

The Hon. Sir George Frederic Verdon, September 13, 1896, aged 62.

Sir John Eric Erichsen, September 23, 1896, aged 78.

Sir George Murray Humphry, September 24, 1896, aged 76.

Baron Ferdinand von Mueller, October 9, 1896, aged 71.

Henry Trimen, October 18, 1896, aged 53.

George Harley, October 27, 1896, aged 67.

Henry Newell Martin, October 28, 1896, aged 44.

Admiral Sir George Henry Richards, November 14, 1896, aged 76.

Sir Benjamin Ward Richardson, November 21, 1896, aged 68.

The Foreign Members are:—

Gabriel Auguste Daubrée, May 29, 1896, aged 82.

August Kekulé, July 13, 1896, aged 66.

Hubert Anson Newton, August 12, 1896, aged 66.

Hippolyte Louis Fizeau, September 18, 1896, aged 77.

Benjamin A. Gould, November, 1896.

Although biographical notices of all will be found in the *Proceedings*, there are some to whose labours I may make brief reference to-day.

Sir William Grove presented the rare spectacle of steady and distinguished devotion to science in spite of the claims of an exacting profession. Grove was an eminent lawyer. Called to the bar in 1835, he was for some time kept from active work by ill-health; but he subsequently acquired a considerable practice, and becoming a Queen's Counsel in 1853, was for some years the leader of the South Wales Circuit. His practice was mainly in patent cases, and the reputation he obtained in that field led to his being appointed a member of the Royal Commission on the Patent Laws. His work as an advocate was, however, by no means confined to such matters; he was one of the counsel—Sergeant Shee and Dr. Kenealy being the others—who defended the Rugeley poisoner, William Palmer, and he was engaged in many other *causes célèbres*.

The eminent position to which he had risen at the bar led to his appointment in November 1871, as a Judge of the old Court of Common Pleas, a post which in 1875 was converted by the Judicature Act into that of a Judge of the High Court. This office he held until his retirement in 1887, when he became a member of the Privy Council.

Throughout the greater part of his long and distinguished legal career, Grove's love of science impelled him to devote a large share of his energies to its pursuit. It is remarkable that his first paper, which was communicated to the British Association in 1839, and which also appeared in the *Comptes rendus*, and in Poggendorff's *Annalen*, contained a description of the "Grove's cell," which was afterwards used in every physical laboratory in the world. This was succeeded by a long series of memoirs, chiefly on electrical subjects, among which one of the best known is that on the gas battery. In 1842 he delivered, at the London Institution, an address which was, in the following year, developed into the celebrated series of lectures: "On the Correlation of Physical Forces." In these he discussed what we should now call the transformations of energy, and, though Prof. Tait, in his "Historical Sketch of the Science of Energy" ("Thermodynamics," p. 58), assigns precedence in calling "attention to the generality of such transformations" to Mrs. Somerville, there can be no doubt that Grove was an independent and very advanced thinker on that subject.

For many years Sir William Grove took a very prominent part in the affairs of the Royal Society, and was one of the most active promoters of the reform of its constitution, which took place in 1847. It is largely to his efforts that we owe our present system of electing only a specified number of Fellows in each year. He was also one of the founders of the "Philosophical Club," and was the last survivor of the original members.

He was President of the British Association in 1866, and, in the course of his address, observed: "The Kew Observatory, the petted child of the British Association, may possibly become an important national establishment; and, if so, while it will not, I trust, lose its character of a home of untrammelled physical research, it will have superadded some of the functions of the Meteorological Department of the Board of Trade, with a staff of skilful and experienced observers" ("Correlation and Continuity." Fifth Edition, 1867, p. 278). Although the British Association long ago handed over the care of its "petted child" to a Committee appointed by the Royal Society, the Society and the Association have lately appointed a joint Committee to urge the Government to supply the funds for converting the Kew Observatory into a "national establishment" similar to the Reichsanstalt at Charlottenburg. We are thus striving to realise to-day the suggestion thrown out, thirty years ago, by Grove.

In Sir Joseph Prestwich we have lost almost the last link that remained which connected geologists of the present day with the founders of the science in the first half of this century. To him we are indebted, not only for the first comprehensive classification of the tertiary beds of this country—to several of which he assigned the names by which they will henceforth be universally known—but, also, for their correlation with the strata of the Paris Basin. To him, also, is due the credit of having been the first to establish the authenticity of the remains of human workmanship found in the drift-deposits of the valley of the Somme, and of thus having laid secure foundations on which arguments as to the extreme antiquity of man upon the earth may be based. In France his name was known and respected as much as in England, and it would be hard to say how much of the advance in geological knowledge during the last sixty years was not due to his unintermitted labours, which extended over the whole of that period.

The earliest scientific investigation of Armand Hippolyte Louis Fizeau was on the use of bromine in photography, and was published in 1841. He will always be remembered as the first who carried out experiments designed to measure the velocity of light produced by a terrestrial source, and travelling through a comparatively small distance near the surface of the earth. These observations, made in 1849, were very difficult, but the velocity deduced from them differs by only about 5 per cent. from the mean of all the best modern results. The value of the method employed is attested by the fact that a quarter of a century afterwards it was adopted by M. Cornu, and that with the improved apparatus employed by him it gave results of the highest accuracy.

A few years afterwards Fizeau performed another classical experiment, by which he measured the change in the velocity of light produced by the motion of the medium in which it travels.

He also devised an extremely delicate method (based on the interference of light) of determining the coefficients of thermal expansion of small bodies, such as crystals. The instrument he designed has been carefully studied by the Bureau International des Poids et des Mesures, with very satisfactory results.

On account of these and other researches, M. Fizeau has, for nearly half a century, occupied a conspicuous position among European physicists. He was awarded the Rumford Medal in 1866, and became a Foreign Member of the Royal Society in 1875.

Our distinguished Foreign Member, Prof. Hubert Anson Newton, Senior Professor of Mathematics at the Yale University, New Haven, died at his home in New Haven on August 12 last. He was born at Sherbourne, in the State of New York, in 1830; studied at Yale College, where he graduated in 1850, and was called to the Chair of Mathematics in the University at the early age of twenty-five.

On the organisation of the Observatory of the University in 1882, Prof. Newton was appointed Director; but though he resigned this position in 1884, the whole policy and success of the Observatory ever since, and, indeed, its very existence, are in no small measure due to his warm interest and untiring efforts.

Prof. Newton's name will ever remain associated with his important researches on Meteor Astronomy, beginning as early as 1860; and with his inquiry into the possible capture of comets by Jupiter and other planets. His historical investigations, and discussions of the original accounts, showed that the phenomena of meteor showers are of a permanent character, and come within the range of Celestial Dynamics, and that predictions of returning meteoric displays are possible.

Prof. Newton was President of the American Association for the Advancement of Science in 1885, and was for many years an Associate Editor of the *American Journal of Science*. He was a man of noble character, held in universal esteem, and greatly beloved by all those to whom he was personally known.

The death of August Kekulé will be felt as a severe loss to chemical science all over the world. Not only did his great activity in original research enrich organic chemistry with many new and interesting compounds, but his announcement of the tetradic valency of carbon, and, especially, his theoretical conception of the benzene ring, gave an impulse to the study of structural chemistry which has introduced order into the vast array of organic compounds, both of the alcoholic and aromatic types, and has not, even yet, expended itself. In recognition of his lifelong work, the Council of the Royal Society awarded Prof. Kekulé the Copley Medal in 1885.

Another Foreign Member who has passed away from us during the year is the distinguished mineralogist and geologist, M. Daubrée. After leaving the École Polytechnique in 1832, he was sent on a mission to investigate the modes of occurrence of tin-ore in Cornwall and on the continent. His reports showed such ability that he was appointed Professor of Mineralogy and Geology at Strasburg, at the age of twenty-five; afterwards (1861–2) he became Professor of Geology at the Musée d'Histoire Naturelle at Paris, and at the same time Professor of Mineralogy at the École des Mines; in the same year he succeeded to the Chair at the Institut vacated by M. Cordier. From 1872 to 1884, when the rules of the Service made retirement by reason of age compulsory, he acted as Director of the École des Mines.

M. Daubrée was the leader in France in experiments for the synthetic reproduction of minerals and rocks, and his laboratory furnace was the first to yield crystals of oxide of tin having the lustre, colour, and hardness of the mineral cassiterite; his memoir on the zeolites and other minerals, produced since Roman times through the action of the hot springs of Plombières on the bricks and concrete, has been of general interest both to mineralogists and geologists. Other important experiments led him to infer that circulating water, rather than heat or vapours, has been the essential agent in all phenomena of rock transformation. M. Daubrée gave much attention to the description and classification of meteorites, and made numerous experiments relative to the reproduction of material having similar characters.

The Council was much occupied during the earlier part of the session with the consideration of the proposed "Standing Orders" relating to the conduct of the meetings, and to the publications of the Society—a subject which has engaged the anxious attention of previous Councils. In framing these Standing Orders two principal objects were kept in view. Firstly, to increase the interest of the meetings by giving greater freedom in the conduct of them, and by enlarging the opportunities for discussion; and secondly, to obtain a more secure, and, at the same time, more rapid judgment as to the value of communications made to the Society; so that, while the high standard of the *Philosophical Transactions* is retained, or even raised, greater rapidity in the publication of these and of the *Proceedings* may be attained. To secure these latter objects, the Council has called to its aid, in the form of Sectional Committees, a number of Fellows much greater than that of the Council itself, to whom will be entrusted the task of reviewing the communications to the Society, and of making to the Council such recommendations with respect to them as may seem desirable. It is further probable that by using the special knowledge of the several Sectional Committees in the detailed consideration of special questions, the Council will have more time at its disposal than it has at present to consider the matters of larger policy which are so frequently brought before it.

It soon became evident that no satisfactory Standing Orders securing these advantages could be drawn up which would not be in some way or other inconsistent with the Statutes at present in operation. It was accordingly resolved to modify the Statutes; and this has been done by giving to certain Statutes a more general form than that in which they have for a long time appeared, so that such alterations of detail as may from time to time seem desirable may be effected by changes in the Standing Orders only, without interfering with the Statutes. I gladly avail myself of this opportunity of acknowledging the great help which the Council received from Mr. A. B. Kempe, in respect to the many legal points which arose in connection with the change of Statutes. A copy of the Statutes, as amended during the present session, as well as of the Standing Orders adopted, will be found in the Year-book, which has been instituted by one of the new Standing Orders, and which will be published each year, as soon after the Anniversary Meeting as possible.

The International Conference called to consider the desirability and possibility of compiling and publishing, by international co-operation, a complete catalogue of scientific literature, was duly held; and the Society may be congratulated on the successful issue of a meeting, to the preparations for which a special International Catalogue Committee, appointed by, and acting under the authority of, the Council, had devoted much time and labour. The Conference met in the apartments of the Society on July 14, 15, 16, and 17, under the presidency of the Right Hon. Sir J. Gorst, Vice-President of the Committee of Council on Education, and was attended by forty-one delegates, representing nearly all countries interested in science. The Society was represented by the Senior Secretary, Prof. Armstrong (Chairman of the International Catalogue Committee), Mr. Norman Lockyer, Dr. L. Mond, and Prof. Rücker. Three other Fellows of the Society—Dr. D. Gill, Prof. Liversidge, and Mr. R. Trimen—were among the delegates appointed by Colonial Governments.

The Conference resolved that it was desirable to compile and publish a catalogue of the nature suggested in the original circular issued by the Royal Society, the administration being carried out by an International Central Bureau, under the direction of an International Council, with an arrangement that each of such countries as were willing to do so, should, by some national organisation, collect and prepare for the Central Bureau all the entries belonging to the scientific literature of the country. It was further resolved that the language of the catalogue should be English, and a proposal that the Central Bureau should be placed in London was carried by acclamation. The Conference finding itself unable to accept any of the systems of classification proposed, requested the Royal Society to form a Committee which should consider this and other matters which were left undecided by the Conference. The Council are already taking steps to perform the duties thus entrusted to them by the Conference.

The delegates of the Society reported that the whole proceedings of the Conference were carried on with remarkable good feeling, and even unanimity, and that the confidence felt and expressed by the various delegates in the fitness of the Royal Society to complete the work begun by the Conference was most gratifying.

In connection with the fact that the proposed International Catalogue is to be in part arranged according to subject matter, it may be stated that the Council, acting upon a resolution of the International Catalogue Committee, have taken steps towards the practice of appending subject indices to the papers published by the Society, and have recommended the same practice to other Societies.

The work connected with the Society's own Catalogue is progressing. Vol. XI, the last of the decade 1874–83, has been published, and the preparation of the Supplement, which has been found necessary for this and preceding decades, is being pushed on.

For the Subject Index to the Catalogue, slips have been prepared, and the Catalogue Committee will soon have to advise the Council as to the system of classification to be adopted.

The Grant of 1000*l.*, in aid of publications, which My Lords of the Treasury promised last summer to place upon the Estimates of this year, has been sanctioned by Parliament, and a moiety of it has already been paid to the Society. The Council have already felt the great advantage of having this money at their disposal, and have framed regulations for its administration, which they trust will be found to work satisfactorily.

The Council have made some small changes (which have been approved by My Lords of the Treasury) in the Regulations for the administration of the Government Grant of 4000*l.* in aid of scientific inquiries, directed chiefly towards more effectually securing that Grants made should be expended for the purpose for which they were given, and that objects of permanent interest obtained by Grants should be properly disposed of. The only two Grants made this year which call for special mention are that of 1000*l.* to the Joint Permanent Eclipse Committee of the Royal and Royal Astronomical Societies, for observations of the Solar Eclipse of August, and that of 800*l.* for boring a coral reef in the Pacific Ocean, administered by the Committee appointed by the Royal Society, both drawn from the Reserve Fund.

The Expedition to bore the Coral Reef received valuable assistance from My Lords of the Admiralty, who directed H.M.S. *Penguin* to carry the observers from Sydney, N.S.W., to Funafuti, the seat of the boring, and to render the Expedition all possible help during the whole of the operations. I desire to express on behalf of the Society our recognition of this renewed token of the willingness of My Lords of the Admiralty to further scientific inquiry. Though the full Report of the Expedition has not yet reached the Council, information has been received to the effect that the boring operations had to be suspended when a depth of only 75 feet had been reached; a layer of sand and boulders presenting obstacles which the experts employed were unable to overcome. It is much to be regretted that an undertaking which promised scientific results of very great value has thus so far failed.

The appeals of the Council to H.M. Minister for Foreign Affairs and to My Lords of the Admiralty for assistance to the Eclipse Expeditions met with most cordial and effective response, for which we would express our gratitude. We also desire to acknowledge the courtesy shown and help afforded to the observing parties in Norway and Japan by the respective Governments of those countries, and to record our high appreciation of the enthusiastic and effective aid given to those under the direction of Mr. Norman Lockyer, at Vadsö, by Captain King Hall and the officers and crew of H.M.S. *Volage*.

Both in Norway and in Japan unfavourable weather rendered to a large extent nugatory the elaborate preparations which had been made for observing the eclipse. But British astronomy was splendidly saved from failure on this important occasion by

the munificence and public spirit of Sir George Baden Powell, who fitted up, at his own expense, and accompanied an expedition in his yacht *Otario* to Novaya Zemlya. The instruments employed were provided by our Fellows, Mr. Lockyer, and Mr. Stone, of the Radcliffe Observatory, Oxford; and the observations were entrusted to Mr. Shackleton, one of the computers employed by the Solar Physics Committee. In brilliant weather photographic observations were made, which promise to yield novel results of a highly important character.

At the request of the President of the Board of Trade the Council nominated, in March, Profs. Kennedy and Roberts-Austen as two members of a Committee to investigate the loss of strength in steel rails. So far as I am aware, the Committee has not yet made its report. More recently, in July, the Council, at the request of H.M. Secretary for Colonial Affairs, appointed a Committee to consider, and if necessary to investigate, in conjunction with Surgeon-Major Bruce, who has made important researches in the matter, the disease caused in cattle in Africa by the Tsetse fly. The Committee is still engaged on the inquiry.

We believe that the Council, in cordially responding to requests like the above, and in freely placing at the disposal of H.M. Government its scientific knowledge and its acquaintance with scientific men, is performing one of its most important functions. The Council of the Royal Society is again and again called upon to approach H.M. Government on behalf of the interests of science, and when it does so always meets with a cordial reception and a respectful hearing, even on occasions when public necessities prevent a favourable reply being given to its requests. In return, the Council believes it to be its duty (when called upon to do so), not only to place its own time and labour ungrudgingly at the service of H.M. Government, but also to ask for the co-operation of other Fellows of the Society, or even other scientific men not Fellows of the Society, feeling confident that whenever the matter in hand has practical bearings beyond the simple advancement of Natural Knowledge, the value of a scientific man's time and energy will be duly considered.

Some correspondence has taken place with the War Office relative to resuming the borings in the Delta of the Nile, which were carried on for a time some years ago, and which, though not completed, yielded valuable results. The Expedition to the Soudan has, however, prevented anything being done. The Council learn with pleasure that the old borings, undertaken for a purely scientific object, have indirectly been a valuable means of supplying certain districts of the Delta with sweet water.

If anything had been needed to justify the meetings for discussion recently established, it would have been supplied by the brilliant success of that held during the present session on Colour Photography. On that occasion, M. Lippmann gave us a demonstration of results of unprecedented beauty, obtained by extremely simple means, though based on profound mathematical reasoning. Such meetings can only prove fruitful when they are held in consequence of some theme needing such a discussion as is afforded by a special meeting; and their occurrence must therefore be uncertain and irregular. The purpose for which they were instituted would be frustrated if they were held at times fixed in any formal way, irrespective of whether they were needed or not.

Three of the informal gatherings recently instituted, limited to Fellows of the Society, have been held during the session, and were judged to be very successful.

The Council has had occasion during the past session to present an address of condolence to her Majesty, the Patron of the Society, on the lamented death of Prince Henry of Battenberg, and to the Royal Academy on the occasion of the death of their President, Lord Leighton. In the absence of Council, during the recess, I sent another message of sympathy on the death of Sir J. Millais.

I had the privilege of presenting, on behalf of the Council, an address of congratulation to our late President, Lord Kelvin, on the occasion of his Jubilee, nobly celebrated in Glasgow last summer, by a very remarkable concourse of scientific men from all parts of the world, assembled to do him honour.

Addresses were also sent to our Foreign Member, Prof. Cannizzaro, on the celebration of his seventieth birthday, and to the University of Princeton, New Jersey, U.S.A., on the occasion of its Sesquicentenary Anniversary.

Under the guidance of the Scientific Relief Committee, the Council has during the year granted 100*l.* to assist scientific persons or their relatives in distress. The Council desire to call the attention of the Fellows to the fact that, during the year, as during past years, the income of the fund has exceeded its expenditure, and that more aid could be given than has been given. With the view of increasing the usefulness of the fund, the Council has added to the list of those who can make representations to the Council concerning relief the Presidents of the Mathematical, Physical, and Entomological Societies.

I cannot but give expression to my deep regret, shared, I am sure, by every Fellow, that Lord Rayleigh, whose tenure of office as Secretary has been marked as much by faithful devotion to the interests of the Society as by scientific brilliancy, has thought it right, in consequence of increasing pressure of other engagements, to retire. But I rejoice that the Council can submit to your suffrages a man well qualified to wear the mantle laid down by Lord Rayleigh.

The Fellows will be pleased to learn that Mr. Rix, who was compelled, by the condition of his health a year ago, to resign the position which he had held for many years with such great advantage to the Society, has much improved under the lighter labour of the Clerkship to the Government Grant Committee.

As his successor in the office of Assistant-Secretary, the Council, out of eighty-four candidates, unanimously selected Mr. Robert Harrison, who entered upon his duties on April 24 last.

The scientific work of the Society during the past year has been full of deep and varied interest. Early in the session the announcement of Röntgen's great discovery burst upon the world. Its wonderful applications to medicine and surgery attracted universal attention to it; and physicists everywhere have since been engaged in investigating the nature of the new rays. Perhaps no outcome of such inquiries has been more remarkable than the fact observed by our Fellow, Prof. J. J. Thomson, that the rays have the power of discharging electricity, both positive and negative, from a body surrounded by a non-conductor; a mass of paraffin wax, for example, behaving in their path for the time being like a conductor of electricity.

It appears that Lenard had before observed the discharge of both kinds of electricity through air by the rays with which he worked. Lenard's rays, however, differ from Röntgen's in being deflectable by a magnet, implying, in the opinion of most British physicists, that they are emanations of highly electrified particles of ponderable matter, while Röntgen's are regarded as vibrations in the ether. The question naturally arises whether Lenard, in the observations referred to, may not have been working with a mixture of Röntgen's rays and his own. While points like these are still under discussion by experts, we cannot but feel that the letter X, the symbol of an unknown quantity, employed originally by Röntgen to designate his rays, is still not inappropriate.

I have before referred to Lippmann's beautiful demonstration and discussion of colour photography in one of our meetings.

Very important researches have been made both by Lord Rayleigh and by Prof. Ramsay into the physical properties of the new substance, helium, discovered by Ramsay in the previous session. Among their most striking results is the fact ascertained by Rayleigh that the refractivity of helium is very much less than any previously known, being only 0·146; between three and four times less than that of hydrogen, the lowest that had before been observed, although helium has more than twice the density of hydrogen. And equally surprising is Ramsay's observation of the extraordinary distance through which electric sparks will strike through helium, viz., 250 or 300 mm. at atmospheric pressure, as compared with 23 mm. for oxygen and 39 for hydrogen. Such properties appear to indicate that in helium we have to do with an exceedingly remarkable substance.

The density of helium appears to be really slightly different according to the mineral source from which it is obtained; and this circumstance seems to give countenance to the opinion arrived at by Lockyer and also by Runge and Paschen, from spectroscopic investigation, that helium is not a perfectly pure gas. But whatever other gas or gases may be mixed with it, they must be as inert chemically as the main constituent; for all Ramsay's elaborate attempts to induce it, or any part of it, to combine with other bodies have entirely failed.

Prof. Roberts-Austen, in the Bakerian lecture, brought before us astonishing evidence that metals are capable of diffusing into each other, not only when one of them is in the state of fusion, but when both are solid. We learned that if clean surfaces

of lead and gold are held together *in vacuo* at a temperature of only 40° for four days, they will unite firmly and can only be separated by a force equal to one-third of the breaking strain of lead itself. And gold placed at the bottom of a cylinder of lead 70 mm. long thus united with it, will have diffused to the top in notable quantities at the end of three days. Such facts tend to modify our views concerning the mutual relations of the liquid and solid states of matter.

Such are a few samples of the many highly interesting communications we have had in physics and chemistry. On the biological side, also, there has been no lack of important work. Of this I may refer to one or two instances.

Prof. Schäfer has given us an account of the well-devised experiments by which he has conclusively established that the spleen is on the one hand capable, like the heart, of independent rhythmical contractions, and, on the other hand, has those contractions controlled by the central nervous system acting through an extraordinary number of efferent channels.

Prof. Farmer and Mr. Lloyd-Williams made a very beautiful contribution to biology in the account they gave of their elaborate investigations on the fertilisation and segmentation of the spore in Fucus. Especial interest attached to this communication, from the fact that it described in a vegetable form exactly what had been established by Oscar Hertwig in Echinodermata, viz., that out of the multitude of fertilising elements that surround the female cell, one only enters it and becomes blended with its nucleus.

Lastly, I may mention the very remarkable investigation into the development of the common eel, which was described to us a fortnight ago by Prof. Grassi, to which I shall have occasion to refer in some detail when speaking of his claims to one of the Society's medals.

These, as I have before said, are but samples of what we have had before us; but I think they are in themselves sufficient to justify the statement that in point of scientific interest the past year has been in no degree inferior to its predecessors.

COPLEY MEDAL.

Prof. Carl Gegenbaur, For. Mem. R.S.

The Copley Medal for 1896 is given to Carl Gegenbaur, Professor of Anatomy in Heidelberg, in recognition of his pre-eminence in the science of Comparative Anatomy or Animal Morphology. Professor Gegenbaur was born in 1826, and a few weeks ago his seventieth birthday was celebrated by his pupils (who comprise almost all the leading comparative anatomists of Germany, Holland, and Scandinavia) by the presentation to him of a "Festschrift" in three volumes. Gegenbaur is everywhere recognised as the anatomist who has laid the foundations of modern comparative anatomy on the lines of the theory of descent, and has to a very large extent raised the building by his own work. His "Grundzüge der vergleichenden Anatomie" was first published in 1859, when he was thirty-three years old. In the second edition, published in 1870, he remodelled the whole work, making the theory of descent the guiding principle of his treatment of the subject. Since then he has produced a somewhat condensed edition of the same work under the title of "Grundriss" (translated into English and French), and now, in his seventy-first year, he is about to publish what will probably be the last edition of this masterly treatise, revising the whole mass of facts and speculations accumulated through his own unceasing industry and the researches of his numerous pupils during the past quarter of a century.

Gegenbaur may be considered as occupying a position in morphology parallel to that occupied by Ludwig in Physiology. Both were pupils of Johannes Müller, and have provided Europe with a body of teachers and investigators, carrying forward in a third generation the methods and aims of the great Berlin professor. Gegenbaur's first independent contribution to science was published in 1853. It was the outcome of a sojourn at Messina in 1852, in company with two other pupils of Johannes Müller, namely Albert Kolliker (still professor in Würzburg) and Heinrich Müller, who died not long afterwards. These young morphologists published the results of their researches in common. Gegenbaur wrote on Medusæ, on the development of Echinoderms, and on Pteropod larvæ. A long list of papers on the structure and development of Hydrozoa, Mollusca, and various invertebrata followed this first publication. The greatest interest, however, was excited among anatomists by his researches on the vertebrate skeleton (commenced already in 1849 with a research, in common with Friedreich, on the skull of axolotl). In a series of beautifully illustrated memoirs he dealt with and added immensely to our knowledge of the vertebral column, the skull, and the limb-girdles and limbs of Vertebrata, basing his theoretical views as to the gradual evolution of these structures in the ascending series of vertebrate forms upon the study of the cartilaginous skeleton of Elasmobranch fishes, and on the embryological characters of the cartilaginous skeleton and its gradual replacement by bone in higher forms. His method and point of view were essentially similar to those of Huxley, who independently and contemporaneously was engaged on the same line of work.

For many years Gegenbaur was professor in Jena, where he was the close friend and associate of Ernst Haeckel, but in 1875 he accepted the invitation to the chair of Anatomy in Heidelberg, and in view of the increased importance of his duties as a teacher of medical students, and therefore of human anatomy, though still continuing his researches on vertebrate morphology, he produced a large treatise on that subject, which has run through two editions. In this work he made the first attempt to bring, as far as possible, the nomenclature and treatment of human anatomy into thorough agreement with that of comparative anatomy, and to a very large extent the changes introduced by him have influenced the teaching of human anatomy throughout Europe and America.

There is probably no comparative anatomist or embryologist in any responsible position at the present day who would not agree in assigning to Gegenbaur the very first place in his science as the greatest master and teacher who is still living amongst us. He is not only watching in his old age the developments of his own early teaching and the successful labours of his very numerous disciples, but is still exhibiting his own extraordinary industry in research, his keenness of intellectual vision, and his unrivalled knowledge and critical judgment.

ROYAL MEDAL.

Sir Archibald Geikie, F.R.S.

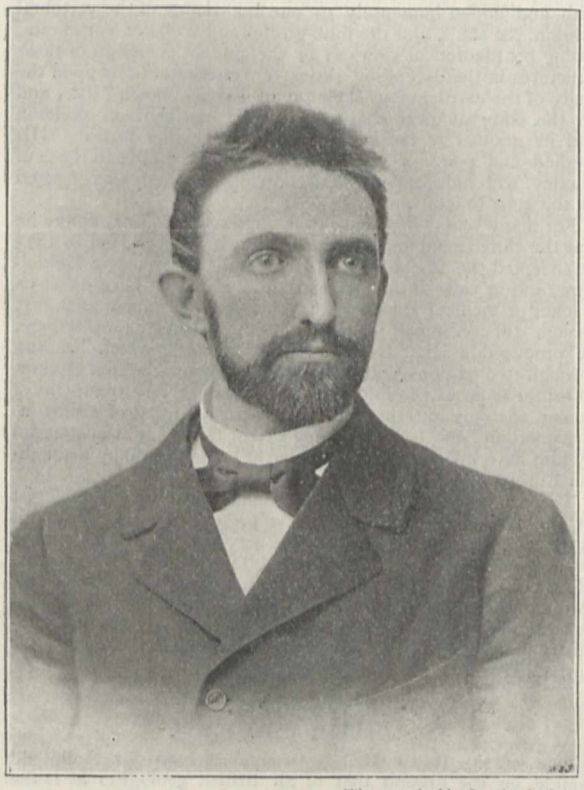
One of the Royal Medals is conferred on Sir Archibald Geikie, on the ground that of all British geologists he is the most distinguished, not only as regards the number and the importance of the geological papers which he has published as an original investigator, but as one whose educational works on geology have had a most material influence upon the advancement of scientific knowledge.

His original papers range over many of the main branches of geological science. His memoir upon the "Glacial Drift of Scotland" (1863) is one of the classics in British geology. His work on the "Scenery of Scotland, viewed in connection with the Physical Geology" (1865) was the first successful attempt made to explain the scenery of that country upon scientific principles, and is still without a rival. His papers on the "Old Red Sandstone of Western Europe" (1878—79) gave for the first time a clear and convincing picture of the great lake period of British geology, founded upon personal observation in the field.

His many original contributions to the volcanic history of the British Isles form a succession of connected papers, crowded with important observations and discoveries, and brilliant and fertile generalisations respecting the abundant relics of former volcanic activity in the British Isles from the earliest geological ages to Middle Tertiary times.

In the first series of these papers—commencing with the "Chronology of the Trap Rocks of Scotland" (1861), and ending with the "Tertiary Volcanic Rocks of the British Isles" (1869), abundant original proofs were advanced of the activity of volcanic action in the Western Isles of Scotland, and of its long duration in geological time. The second series (1871–88) was especially distinguished by the publication of his remarkable paper on the "Carboniferous Volcanic Rocks in the Basin of the Firth of Forth," our earliest, and, as yet, our only monograph on a British volcanic area belonging to a pre-Tertiary geological system. The third series (begun in 1888) commenced with his memoir on the "History of Volcanic Action during the Tertiary Period in the British Isles," a paper which is by far the most detailed and masterly contribution yet made to the subject, and for which the Brisbane Medal was awarded him by the Royal Society of Edinburgh; and this succession of papers has been followed by the publication of others of almost equal importance.

Sir Archibald Geikie has also written many papers and memoirs bearing upon geological processes and their effects,

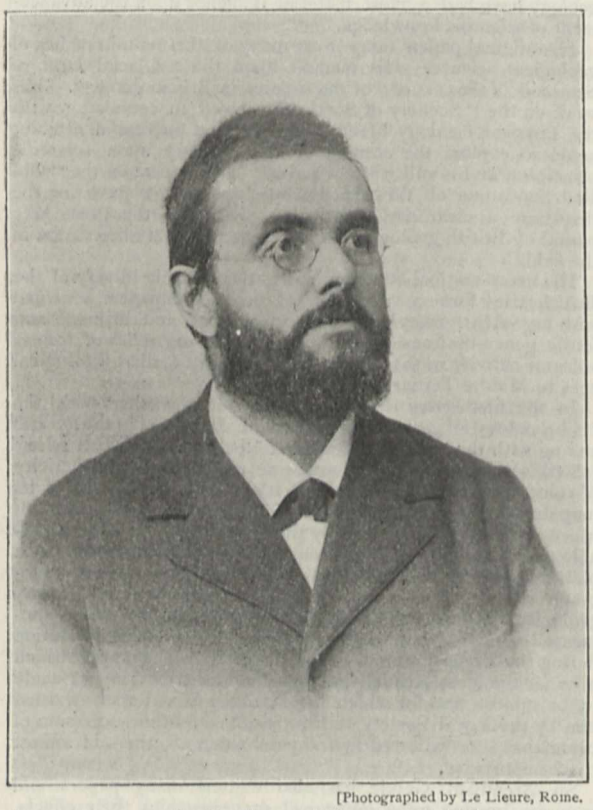


[Photographed by Lantin, Aachen.

PROF. PHILIPP LENARD (*Rumford Medallist*).

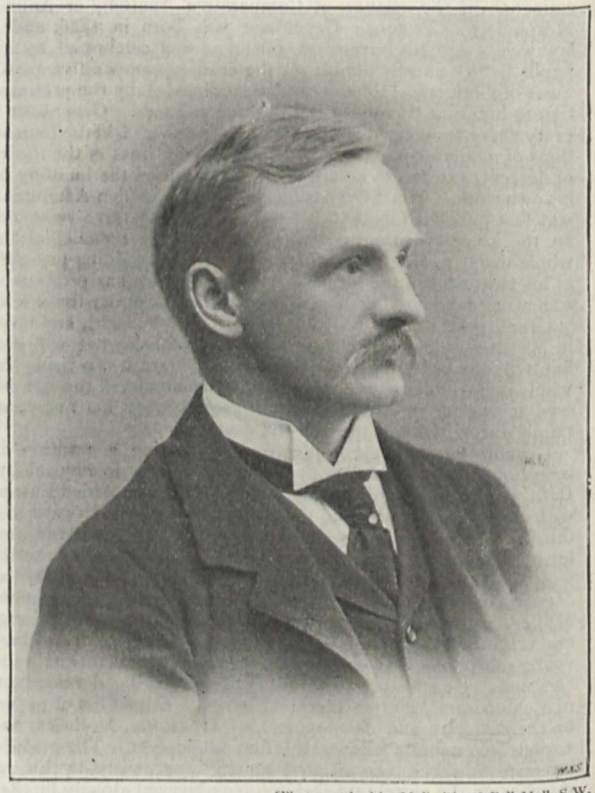
[Photographed by E. Hanistaengl, Frankfurt a/M.

PROF. W. C. RÖNTGEN (*Rumford Medallist*).



[Photographed by Le Lieure, Rome.

PROF. G. B. GRASSI (*Darwin Medallist*).



[Photographed by Melhuish, 58 Pall Mall, S.W.

PROF. C. V. BOYS (*Royal Medallist.*)

which have become permanent parts of our scientific literature. While carrying out this highly important original work in Geology, Sir Archibald has most materially contributed to the advancement and diffusion of scientific knowledge by his many educational works upon Geology and Physical Geography. His "Elementary Lessons on Physical Geography" has passed through several English and foreign editions; his "Outlines of Field Geology" is now in its fifth edition; and his article on Geology—originally contributed to the "Encyclopædia Britannica" in 1879—was afterwards expanded by him into his well-known "Text-book of Geology," which has become the acknowledged British standard of Geology in general.

ROYAL MEDAL.

Prof. C. V. Boys.

The other Royal Medal is awarded to Prof. Boys, who has given to physical research a method of measuring minute forces far exceeding in exactness any hitherto used, by his invention of the mode of drawing quartz fibres, and by his discovery of their remarkable property of perfect elastic recovery.

Prof. Boys has himself made several very important researches in which he has employed these fibres to measure small forces. Using a combination of a thermo-junction with a suspended coil in a galvanometer of the usual D'Arsonval type, a combination first devised by D'Arsonval himself, Prof. Boys developed the idea in the microradiometer, an instrument rivalling the bolometer in the measurement of small amounts of radiation. Its sensitiveness and accuracy were obtained in part by the use of a quartz fibre to suspend the coil, in part by the admirable design of every portion of the instrument. Prof. Boys was the first to show its value in an investigation into the radiation received from the moon and stars.

In this great research on the value of the Newtonian constant of attraction, Prof. Boys used quartz fibres to measure the gravitation forces between small bodies by the Michell-Cavendish torsion method. He redesigned the whole of the apparatus, and, calculating what should be the dimensions and arrangements to give the best results, he was led to the remarkable conclusion that accuracy was to be gained by a very great reduction in the size of the apparatus. This conclusion he justified by a determination of the value of the Newtonian constant, which is now accepted as the standard.

Prof. Boys has also made some remarkable studies by a photographic method of the motion of projectiles, and of the air through which they pass.

All his work is characterised by the admirable adjustment of the different parts of the apparatus he uses to give the best results. His instruments, are, indeed, models of beauty of design.

RUMFORD MEDAL.

Prof. Philipp Lenard and Prof. W. C. Röntgen.

In the case of the Rumford Medal, the Council have adopted a course, for which there are precedents in the awards of the Davy Medal, but which is, as far as the Rumford Medal itself is concerned, a new departure. They have decided to award the Medal in duplicate. It has often happened in the history of science that the same discovery has been made almost simultaneously and quite independently by two observers, but the joint recipients of the Rumford Medal do not stand in this relation to each other. Each of them may fairly claim that his work has special merits and characteristics of its own. To-day, however, we have to deal, not with points of difference, but with points of similarity. There can be no question that a great addition has recently been made to our knowledge of the phenomena which occur outside a highly exhausted tube through which an electrical discharge is passing.

Many physicists have studied the luminous and other effects which take place within the tube; but the extension of the field of inquiry to the external space around it is novel and most important. There can be no doubt that this extension is chiefly due to two men—Prof. Lenard and Prof. Röntgen.

The discussion which took place at the recent meeting of the British Association at Liverpool proved that experts still differ as to the exact meaning and causes of the facts these gentlemen have discovered. No one, I believe, disputes the theoretical interest which attaches to the researches of both; or the practical benefits which the Röntgen rays may confer upon mankind as aids to medical and surgical diagnosis. But whatever the final verdict upon such points may be, the two investigators whom we honour to-day have been toilers in a common field, they have both reaped a rich harvest, and it is, therefore, fitting that the Royal Society should bestow upon both of them the Medal which testifies to its appreciation of their work.

DAVY MEDAL.

Prof. Henri Moissan.

The Davy medal is given to Prof. Henri Moissan.

Notwithstanding the abundant occurrence of fluorine in nature, the chemical history of this element and its compounds has until recently been scanty in the extreme, and, as far as the element in the free state is concerned, an entire blank. And yet from its peculiar position in the system of elements, the acquisition of a more extended knowledge of its chemical properties has always been a desideratum of the greatest scientific interest.

The frequent attempts which have been made from time to time to clear up its chemical history have been constantly baffled by the extraordinary difficulties with which the investigation of this element is beset.

Thanks to the arduous and continuous labours of M. Moissan, this void has been filled up. He has effected the isolation of fluorine in a state of purity, and prepared new and important compounds, the study of which has placed our knowledge of the chemical and physical properties of this element on a level with that of its immediate allies.

During the last few years M. Moissan has turned his attention to the study of chemical energy at extremely high temperatures, and by the aid of the electric furnace, which he has contrived, he has succeeded in obtaining a large number of substances whose very existence was hitherto undreamt of. It is impossible to set bounds to the new field of research which has thus been opened out. The electric furnace of M. Moissan has now become the most powerful synthetical and analytical engine in the laboratory of the chemist.

On studying the accounts which Moissan has given of his researches, we cannot fail to be struck with the originality, care, perseverance and fertility of resource with which they have been carried on. The Davy Medal is awarded to him in recognition of his great merits and achievements as an investigator.

DARWIN MEDAL.

Prof. Giovanni Battista Grassi.

The Darwin Medal for 1896 is awarded to Prof. Grassi, of Rome (late of Catania), for his researches on the constitution of the colonies of the Termites, or White Ants, and for his discoveries in regard to the normal development of the Congers, Murænæ, and Common Eels from Leptocephalus larvæ.

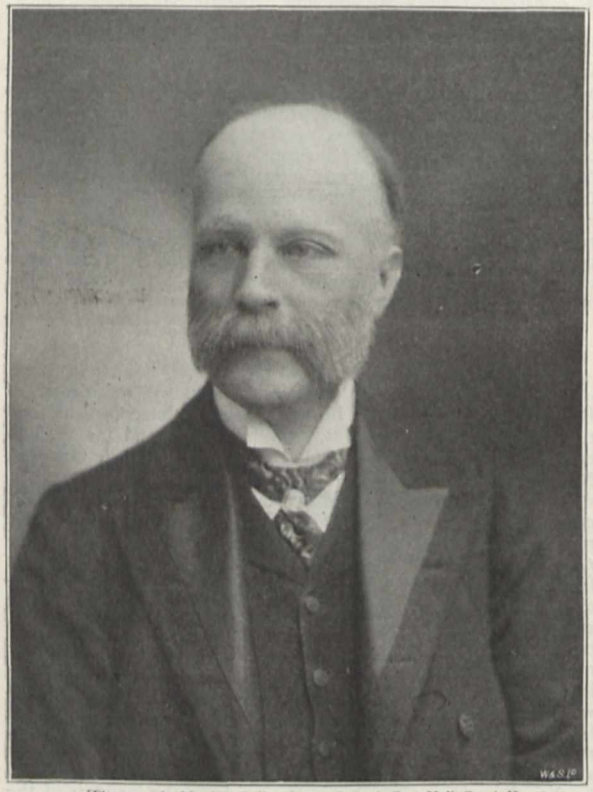
From a detailed examination of the nature and origin of the colonies of the two species of the Termites which occur in the neighbourhood of Catania, viz., *Termes lucifugus* and *Calletermes flavicollis*, he was able to determine certain important facts which have a fundamental value in the explanation of the origin of these and similar polymorphic colonies of insects, and are of first-rate significance in the consideration of the question of the share which heredity plays in the development of the remarkable instincts of "neuters," or arrested males and females, in these colonies. Prof. Grassi has, in fact, shown that the food which is administered by the members of a colony to the young larvæ determines, at more than one stage of their development, their transformation into kings or queens, or soldiers or workers as the case may be, and the value of these researches is increased by the observations which he has made on the instincts of the different forms, showing that they do not in early life differ from one another in this respect, and are all equally endowed with the potentiality of the same instincts. These do not, however, all become developed and cultivated in all alike, but become specialised, as does the physical structure in the full-grown forms.

A very different piece of work, but having a no less important bearing on the theory of organic evolution, is that on the Leptocephali. These strange, colourless, transparent, thin-bodied creatures, with blood destitute of red corpuscles, had been regarded as a special family of fishes, but have been proved by Grassi's patient and long-continued labours to be larval forms of the various Murænoids. The most astonishing case is that of the Common Eel (*Anguilla vulgaris*), the development of which had been a mystery since the days of Aristotle. It had been long known that large eels pass from rivers into the sea at certain seasons, and that diminutive young eels, called in this country Elvers, ascend the rivers in enormous numbers. But,

although the species is very widely distributed, no one in any country had been able to discover how the elvers were produced. Grassi has shown that, large as the eels are that pass into the sea, they are not perfectly developed fish, but only attain maturity in the depths of the ocean. There they in due time breed, and from their eggs are hatched the young Leptocephali, which, after attaining a certain size, cease to feed, and assume the very different form of the elver. The possibility of establishing these remarkable facts depended on the powerful oceanic currents that prevail about the Straits of Messina, bringing up occasionally to the surface the inhabitants of the depths of the sea. Grassi was thus able to obtain, from time to time, both adult eels with fully developed sexual organs and their larval progeny, and he actually observed in an aquarium the development of a *Leptocephalus brevirostris* into a elver.

Such highly meritorious contributions to evolution are fitly recognised by the award of the Darwin medal.

The Society next proceeded to elect the Officers and Council for the ensuing year. The list suggested by the President and Council, and adopted by the Society, was given in these columns on November 12 (p. 38).



[Photographed by Martin Jacobette, Queen's Gate Hall, South Kensington.

PROF. A. W. RÜCKER (*appointed Junior Secretary*).

[We are glad to be able to give portraits of the new Secretary of the Society, and of the recipients of the Rumford medal, Royal medal, and Darwin medal. It was unnecessary to include Sir Archibald Geikie's portrait among these, as it has already been given in our series of Scientific Worthies; and we regret that we have not received the portraits of Prof. Gegenbaur and M. Moissan.]

In the evening the Fellows and their friends dined together at the Whitehall Rooms, Hôtel Métropole, the attendance being larger than any up to the present time. Amongst the guests of the Society were the American Ambassador, the Italian Ambassador, the Speaker of the House of Commons, and the Lord Mayor.

After the usual loyal toasts had been drunk, the President proposed "The Legislature," and the Speaker of the House of Commons responded. The American Ambassador proposed "The Royal Society," and the toast was acknowledged by the President. M. Henri Moissan responded to the toast of "The Medallists." Sir John Lubbock proposed the health of the retiring Secretary (Lord Rayleigh) and the present Secretary (Prof. Rücker), both of whom responded, the evening concluding with the toast of "The Guests," proposed by Prof. Rücker, and acknowledged by the Lord Mayor.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Convocation has approved the holding of an examination in the theory, history and practice of education. The examination is to be held every year, and will be open to members of the University and others, subject to certain regulations. No member of the University is to be admitted who has not kept residence for at least seven terms. "The delegates of local examinations shall have power to make arrangements for lectures and courses of instruction to be given within the University on the theory, history and practice of education. They shall also have power to make arrangements with the managers or teachers of any secondary or other school, whereby students who purpose to be teachers in secondary schools may acquire a practical knowledge of educational methods."

Mr. C. W. M. Bromley, of Kendal Grammar School, has been elected to a Scholarship, and Mr. A. G. Gibson, of Aberystwyth College, to a College Exhibition in Natural Science at Christ Church.

The Junior Scientific Club held a meeting on Friday, November 27. Mr. E S. Goodrich exhibited a cast of Heloderma and some specimens of a deep-sea Cephalopod. Papers were read by Mr. R. Wilkinson on the varieties of *Colias edusa* and *hyale* in England and Switzerland, and by Mr. E. F. Morris on dyeing.

The Provost of Oriel has been re-elected a Delegate of the University Museum.

Messrs. E. S. Craig (University College), J. A. Gardner (Magdalen College), M. S. Pembrey (Christ Church), and W. Garstang (Lincoln College) have been approved by Convocation as examiners for the preliminary examinations in the Honour School of Natural Science.

LORD REAY has been elected President of the University College, London, in succession to the late Sir John Erichsen.

UNDER the will of Mrs. Roxburgh, who died last week, the Bath Technical Schools are bequeathed one-fourth of the residuary estate, after legacies to certain charities have been deducted, to provide scholarships; while the remainder, about £8000, is to be used for the erection of an art gallery.

THE following appointments are announced: Dr. Karl Möbins, professor of zoology in Berlin University, to succeed Prof. Beyrich as director of the Natural History Museum there; Dr. W. Dames, professor of geology, to be director of the geological section of the same museum; Dr. Emil Schmidt to be professor of anthropology in Leipzig University; Dr. Ernst Pringsheim to be associate professor of physics at Berlin; Dr. Traube and Dr. Friedheim to be associate professors of chemistry at Berlin; Dr. Kepinski to be associate professor of mathematics at Krakau; M. Poincaré to be professor of mathematical astronomy and celestial mechanics in the University of Paris, and M. Boussinesq to be professor of mathematical physics in the same University; Prof. Schenk to be professor of anatomy in the University at Vienna; and Dr. London, of the University of Breslau, to be associate professor of mathematics there; Dr. Kippenberger, Privat-docent at Jena, to be professor of chemistry in the medical school at Kairo; Dr. R. H. Saltet to be professor of hygiene at Amsterdam, in succession to Dr. M. J. Foster; Dr. Gilson to be extraordinary professor of chemistry and pharmacy at Ghent; Dr. C. Julin to be professor of anatomy at Liege; Dr. Theodor Beer to be privat-docent in comparative anatomy at Vienna; Dr. Bubnoff, of Iurieff (Dorpat), to be professor of hygiene at Moscow, in succession to Prof. Erisman.

THE necessity of early legislation for the promotion of technical and secondary education was urged by a large and influential deputation, representing many educational bodies and associations, which waited upon the Duke of Devonshire on Wednesday in last week. In introducing the deputation, Sir Henry Roscoe

referred to the Report of the Royal Commission on Secondary Education, and the remarkable unanimity with which it had been received by educationists. (For a criticism of the Report from the scientific side, see NATURE, vol. liii. p. 79.) The bodies for which he spoke approached the subject especially from the point of scientific and technical education of the country. It is an acknowledged fact that the higher technical education of the country suffers from the lack of suitable preparation in the secondary schools, and that little can be hoped for in the way of systematic and advanced technical instruction until a basis of secondary education, such as has long existed in continental countries, has been established. Fortunately this organisation, for which Sir Henry Roscoe pleaded on behalf of the deputation, is unaccompanied by many of the difficulties which surround the subject of primary education, and, therefore, in this case Parliamentary unanimity in securing the great benefits which such a secondary system would confer upon the country might be expected. No detailed statement was made as to the form which legislation should take, but Sir Henry Roscoe pointed out that the most important recommendations of the Royal Commission are, in the first place, the establishment of local authorities, consisting of not smaller areas than counties and county boroughs, and, in the second place, of a central authority, chiefly of an advisory character. After several other members of the deputation had spoken, the Duke of Devonshire said that the Government hoped to deal with the better organisation of secondary schools in the next session of Parliament. It is intended to follow, generally speaking, the lines which were indicated in the proposed measure of last year.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 27.—Prof. Rücker, Vice-President, in the chair.—The President (Captain Abney) described and exhibited some apparatus for giving diagrams of the efficiency of a photographic shutter. In addition to the "speed" of a shutter, which is concerned with the interval (T) between the moments when the shutter admits the *first* and *last* rays of light, it is most important to know the efficiency of the shutter. The efficiency may be defined as follows: Let x represent the portion of the available aperture of the lens exposed by the shutter at a time t, and let X be the total available aperture. Then if the shutter were perfectly efficient, *i.e.* if the whole of the aperture were efficient during the time T, the quantity of light admitted would be proportional to XT. In other cases the quantity of light admitted will be proportional to $\int_0^T x dt$. Hence the efficiency is

$$\frac{\int_0^T x dt}{XT}.$$

The apparatus employed by the author consists of a slit placed near the shutter, so that the length of the slit is at right angles to the direction of motion of the shutter, and a lens by means of which an image of the slit is thrown on to a rotating drum or plate. The slit, when the shutter is open, is illuminated by the light of an arc lamp, a condensing lens being employed. In order to obtain a time scale two devices have been employed. In one of these a spoked wheel is rotated at a known speed so that each spoke, as it passes, momentarily cuts off the light. In the other arrangement a small lens, attached to the prong of a tuning-fork, throws a small spot of light on to the rotating drum, and thus gives a wavy line. Bromide paper or celloidin films are employed to record the diagrams. If the shutter were perfectly efficient, the diagram would consist of a rectangle crossed, if the rotating wheel is used, by a number of white lines, caused by the interruption of the light by the spokes of the wheel. These lines give a time scale by which the speed of the shutter can be calculated. The author showed a number of diagrams taken by the apparatus and illustrating the behaviour of different shutters under varying conditions. In one of these the rebound of the shutter at quick speeds is clearly shown by each of the principal diagrams being followed by a small auxiliary one. Prof. Perry said he supposed that what was required was some method of showing the *motion* of the shutter. Mr. Boys suggested that the efficiency might be defined as the ratio of the area of the actual diagram to that of the rectangle having as base the time between the commencement and end of the exposure. Mr. Inwards asked if the author had made any experiments to determine the amount of shake communicated to the camera by the motion of the shutter. Prof. Perry said what was required was an exceedingly light shutter that got up a great speed before it reached the aperture. The author, in his reply, said he had investigated the question of the shake due to the movement of the shutter. He considered that the amount of this shake depended upon the extent of the movement of the centre of gravity of the shutter. With a small stop the Thornton-Pickard shutter fulfilled Prof. Perry's requirements. The experiments have shown that the exposure does not always vary as the square of the aperture, on account of the small efficiency of some shutters for oblique rays. Thus in one case, by doubling the aperture, you only increase the light threefold.

Royal Meteorological Society, November, 18.—Mr. E. Mawley, President, in the chair.—Mr. W. Ellis, F.R.S., gave an account of the Proceedings of the recent International Meteorological Conference, which was held at Paris, from September 17 to 23. The Hon. F. A. Rollo Russell read a paper on haze, fog and visibility. Haze is most prevalent when the wind is from the north-east, and is due probably to excess of dust brought about by conflicting currents. The causes of fog are to a great extent the same as the causes of haze, although radiation in certain states of the air and ground plays a more conspicuous part. The main cause of fog is mixture of airs of different temperatures; and the attainment of a size of water particle so much larger than in the case of haze is due to suddenness of mixture, greater humidity, or greater differences of temperature. The conditions favourable to visibility are dryness of the air near the ground level, uniformity of temperature and moisture, radiation below the mean, steady and homogeneous winds through a great depth of the atmosphere, approximation of the temperatures of sea and land, and a number of dust particles less than the mean.

PARIS.

Academy of Sciences, November 23.—M. A. Cornu in the chair.—On some properties of uranic rays, by M. H. Becquerel. The rays emitted by uranium and its salts have some properties in common with the X-rays, but differ from them in being reflected and refracted like light. Even after eight months in complete obscurity, this radiation from uranium and its salts remains unchanged. The property of discharging an electrified body, which is communicated to a gas by exposure to the X-rays, or by transmitting electric sparks through it, is also possessed by air which has passed over uranium in the dark.—Decimalisation of the hour, by M. Bouquet de la Grye.—Theoretical study on the pitching of submarine vessels, by M. Leflaive. An investigation of the relations between the displacement, speed, and depth under water; the pitching is also studied, and the results displayed graphically.—On a particular case of the motion of liquids, by M. E. Fontaneau.—Euclid's postulate, considered as a property of three-dimension space, by M. G. Morosov.—Observations on the new Perrine Comet (1896, November 2) made at the Observatory of Algiers, by MM. Rambaud and Sy.—On algebraic curves of constant torsion, by M. Eugène Fabry.—On an application of the theory of continued groups to the study of the singular points of linear differential equations, by M. F. Marotte.—On the singularities of the equations of dynamics, and on the problem of three bodies, by M. P. Painlevé.—On the movement of a solid in an infinite liquid, by M. R. Liouville.—On the distribution of deformations in metals submitted to stresses, by M. George Charpy. A continuation of the discussion with M. Hartmann.—Discharges by the Röntgen rays; influence of temperature and pressure, by M. Jean Perrin. It is found that for the same gas, at a constant temperature the quantity of electricity lost per unit mass of gas is independent of the pressure, and proportional to the absolute temperature. It is noteworthy that according to the kinetic theory of gases the energy possessed by a molecule is also independent of the pressure and proportional to the absolute temperature.—Illusions which accompany the formation of penumbra, and applications of these to the X-rays, by M. G. Sagnac. No conclusions can be drawn from any peculiarities exhibited by shadows, without taking into account the extent and form of the source, the relative lustre of its different points, the form and position of the opaque body, and the photometric properties of the retina or photographic plate. The precaution should always be taken of replacing the Röntgen tube, in any

given experiment, by a luminous source emitting ordinary light, and of a shape and lustre as nearly similar as possible to the Crookes' tube.—Action of some hydrogen compounds upon thionyl chlorides, by M. A. Besson. With hydrogen iodide complete decomposition occurs, with formation of hydrogen chloride, iodine, sulphur dioxide, and sulphur. With hydrogen sulphide in a freezing mixture of ice and salt the main reaction is

$$2SOCl_2 + 2H_2S = 4HCl + SO_2 + 3S,$$

but a little S_2Cl_2 is formed in a secondary reaction, especially if the temperature is allowed to rise. Hydrogen phosphide gives hydrogen chloride, and a mixture of P_4S_3, phosphorus, $POCl_3$ and $PSCl_3$.—On the neutral crystallised chromite of magnesium, by Em. Dufau.—The salts of hexamethylene, by M. Marcel Delépine. Measurements of the heat of neutralisation by hydrochloric, sulphuric, nitric, and oxalic acids, and the heat of solution of the hydrochloride, the three sulphates, and two nitrates.—The function of boric acid in glasses and enamels, by M. L. Grenet. An experimental study of the relation between the quantity of boric acid in a glass and its coefficient of expansion.—On the non-retractile blood clot; suppression of the formation of blood serum in some pathological states, by M. G. Hayem.—Research on caramel in wines. Possible confusion with coal-tar colours, by M. A. J. da Cruz Magalhaês.—On the osmotic pressure in germinating grains, by M. L. Maquenne. The osmotic pressure was determined indirectly by taking the freezing points of the expressed juices. The values found in some cases approached ten atmospheres.—On the Elasipoda collected by the *Travailleur* and *Talisman*, by M. Rémy Perrier.—On compound nucleoles, especially in the egg of the Annelida, by M. Auguste Michel.—On the development of the "Black Rot" in the vine, by M. P. Viala.—On the development of a fungus in a liquid in motion, by M. Julien Ray.—Geological researches in the Central Caucasus, by M. Vénukoff.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 3.

LINNEAN SOCIETY, at 8.—Does Natural Selection play any part in the Origin of Species among Plants: Rev. Geo. Henslow.

CHEMICAL SOCIETY, at 8.—Election of Fellows.—Constitution and Colour: Arthur G. Green.—Some Experiments on Sea-water: E. Sonstadt.—Derivatives of α-Hydrindone: C. Revis and Dr. F. S. Kipping.—Notes on Nitration: Dr. H. E. Armstrong.—2 : 3′ Bromobetanaphthol: Dr. H. E. Armstrong and W. A. Davis.—Derivatives of Nitrobetanaphthols: W. A. Davis.—Morphotropic Relations of Betanaphthol Derivatives: W. A. Davis.—Researches on Tertiary Benzenoid Amines: Miss C. Evans.

FRIDAY, DECEMBER 4.

GEOLOGISTS' ASSOCIATION, at 8.—The Foraminifera of the Thanet Beds of Pegwell Bay: H. W. Burrows and Richard Holland.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Address by J. Wolfe Barry, C.B., F.R.S. (President).—Railway Signalling: David W. Kinmont.

SUNDAY, DECEMBER 6.

SUNDAY LECTURE SOCIETY (St. George's Hall), at 4.—New Zealand—the World's Wonderland: W. Herbert-Jones.

MONDAY, DECEMBER 7.

SOCIETY OF ARTS, at 8.—The Use of Gas for Domestic Lighting: Prof. Vivian B. Lewes.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Journey to the Sources of the Niger: Colonel J. K. Trotter.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Alkali Manufacture: An Historical Sketch: Alfred E. Fletcher.—Notes on the Spontaneous Oxidation of Aluminium in contact with Mercury: H. F. Hunt and L. J. Steele.

VICTORIA INSTITUTE, at 4.30.

TUESDAY, DECEMBER 8.

ANTHROPOLOGICAL INSTITUTE, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Tipping and Screening Coal: James Rigg.—The Surface Plant at Kirkby Colliery: Thos. Gillott.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Dr. Selle's Process for Natural-Colour Photography: Dr. Neuhaus.

WEDNESDAY, DECEMBER 9.

SOCIETY OF ARTS, at 8.—Mining at Great Depths: Bennett H. Brough.

SANITARY INSTITUTE, at 8.—Soils and their Suitability for Sewage Farms, with the *rôle* of Bacteria in Sewage Disposal: Dr. Samuel Rideal.

THURSDAY, DECEMBER 10.

ROYAL SOCIETY, at 4.30.—On Prof. Hermann's Theory of the Capillary Electrometer: G. J. Burch.—An Attempt to determine the Adiabatic Relations of Ethyl Oxide: E. P. Perman, Prof. Ramsay, F.R.S., and J. Rose-Innes.—Experiments in Examination of the Peripheral Distribution of the Fibres of the Posterior Roots of some Spinal Nerves, Part II.: Prof. Sherrington, F.R.S.

MATHEMATICAL SOCIETY, at 8.—A Discovery in the Theory of Compound Denumeration: Prof. Sylvester, F.R.S.—On the Stationary Motion of a System of Molecules having Finite Dimensions: S. H. Burbury, F.R.S. Concerning the Abstract Groups of Order K! and ½ K! Holoedrically Isomorphic with the Symmetric and the Alternating Substitution Groups on K Letters: Prof. E. H. Moore.—On the Influences of Viscosity on Waves and Currents: S. S. Hough.—On a Series of Co-trinodal Quartics: H. M. Taylor and W. H. Blythe.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, at 8.—Notes on the North American Agrotis subgothica: W. Mansbridge.

FRIDAY, DECEMBER 11.

PHYSICAL SOCIETY, at 5.—The Application of Physics and Mathematics to Seismology: Dr. C. Chree.—On Musical Tubes: R. J. Rudd.

ROYAL ASTRONOMICAL SOCIETY, at 8.

BOOKS AND SERIALS RECEIVED.

BOOKS.—Autobiographical Sketch of James Croll, with Memoir of his Life and Work: J. Campbell Irons (Stanford).—The Aurora Borealis: A. Angot, translated (K. Paul).—Navigation, Practical and Theoretical: D. Wilson-Barker and W. Allingham (Griffin).—Practical Electricity: Prof. Ayrton, Vol. 1, new edition (Cassell).—The Exploration of the Caucasus: D. W. Freshfield, 2 Vols (Arnold).—Twenty-fourth Annual Report of the Local Government Board. Supplement in continuation of the Report of the Medical Officer for 1894-5, on Oyster Culture in relation to Disease (Eyre and Spottiswoode).—The Russian Fur-Seal Islands: L. Stejneger (Washington).—Bicycles and Tricycles: A. Sharp (Longmans).—A History of Elementary Mathematics: Prof. F. Cajori (Macmillan).—Motive Power and Gearing for Electrical Machinery: E. T. Carter (*Electrician* Company).—Crags and Craters: W. D. Oliver (Longmans).—Fur and Feather Series. Red Deer: Macpherson; Cameron of Lochiel: Viscount Ebrington and Shand (Longmans).—Pocket Atlas of the World: J. G. Bartholomew, 10th edition (Walker).—Manual of Determinative Mineralogy, &c.: G. J. Brush, revised and enlarged by Prof. Penfield (Chapman).—Guttersnipes: Phil May (Leadenhall Press).—The Struggle of the Nations—Egypt, Syria, and Assyria; G. Maspero, translated by M. L. McClure (S.P.C.K.).

SERIALS.—English Illustrated Magazine, Christmas (198 Strand).—Longman's Magazine, December (Longmans).—Chambers's Journal, December (Chambers).—Lloyd's Natural History. Mammals: R. Lydekker, Part 3; Monkeys: Dr. H. O. Forbes, Part 3 (Lloyd).—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, 1896-97, Vol. 41, Part 1 (Manchester).—Journal of the Anthropological Institute, November (K. Paul).—Good Words, December and Christmas (Isbister).—Sunday Magazine, December and Christmas (Isbister).—Natural Science, December (Page).—History of Mankind: F. Ratzel, translated, Part 14 (Macmillan).—National Review, December (Arnold).—Humanitarian, December (Hutchinson).—Contemporary Review, December (Isbister).—Physical Review, (November-December (Macmillan).—Century Magazine, December (Macmillan).—Scribner's Magazine, December (Low).

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