THURSDAY, MARCH 21, 1907.

SEX AND CHARACTER.

Sex and Character. By Otto Weininger. Authorised translation from the sixth German edition. Pp. xxii+356. (London: W. Heinemann, 1906.) Price 17*s.* net.

WEININGER'S interest in his problem is much more philosophical than scientific, but he finds the basis of his theory in a biological idea, and thus challenges scientific criticism. His philosophy is of the non-empirical type, and he is strongly influenced by Plato and the transcendentalism of Kant. His psychology and ethics are thus static and non-evolutionary, and he is the less likely to find any strong support from modern thinkers; for whatever in these days may be our views as to the method by which it has come about, the *fact* of organic evolution is beyond dispute, and the application of evolutionary ideas to psychology and ethics hardly less compelling.

The book is an attempt to reduce the relation of the sexes to a single principle, and Weininger brings arguments from biology, psychology, logic, and ethics to enforce his claim to have established it. He begins by predicating a permanent bisexual condition in human beings, pointing out that the sexual condition in the embryo is derived from an earlier indeterminate stage, and that there are always traces of bisexuality in the adult, *e.g.* the down on a woman's face in the position of the beard, and the presence of glandular tissue connected with the nipples in man.

"The fact is that males and females are like two substances combined in different proportions, but with either element never wholly missing. We find, so to speak, neither a man nor a woman, but only the male condition and the female condition. Any individual 'A' or 'B' is never to be designated merely as a man or as a woman, but by a formula showing that it is a composite of male and female character combined in different proportions, for instance as follows:—

$$A=\frac{aM}{a'W} \qquad B=\frac{bW}{b'M}$$

always remembering that each of the factors a, a', b, b' must be greater than 0 and less than unity."

Weininger elaborates this biological idea and carries it into the field of psychology and ethics. He seeks to explain the periodic movements for the emancipation of women by the periodic appearance of unusual numbers of women approaching the male standard (his so-called hermaphrodites), and supposes that all such movements die out because the hermaphrodite individuals who create the demand for emancipation after a certain time are no longer produced, an argument which he supports by biological analogies; but though there have been such movements in the past, they were doomed to failure, because it is only in our own epoch that the fear of rape, which is the *real* reason for the suppression and prohibitions accorded to women, has become so small a probability that it may be disregarded in view of the enormous gain to intellect and character afforded by the fullest possible freedom.

Weininger proceeds to inquire what are the essentials of the ideal maleness and the ideal femaleness which form the ends of his series, and on his way elaborates his theories of psychology and ethics. Memory he takes as the basis of logic and of ethics; for without memory there can be no perception of identity, and hence no possibility of a syllogism. The perception of identity necessitates the supposition of a transcendental ego which is out of time; for the ego must be permanent and the same at all times to be able to recognise identity when it turns up. James, however, has shown that for the purposes of psychology all that is necessary is the present thought which contains and remembers and recognises all past thoughts. The thought, then, *is* the thinker, and the transcendental ego a needless and cumbersome abstraction.

How does this male psychology apply to woman? Thus dogmatically Weininger:—Woman has no memory, and hence no perception of identity, hence she is illogical and non-moral. She is incapable of forming concepts; all her ideas are in the vague stage in which the object perceived is inseparable from the character or feeling with which it is perceived. That is to say, in general, her mentality is in a less differentiated or articulated stage than man's. Here again we might find some grounds for seeing a partial truth in our author's contentions, if he were content to say that, on the whole, this was true of the average woman as compared with the average man, all due allowance being made for education and logical training, but he goes very much farther than this. "Woman has no ego," and, moreover, "I must again assert that the woman of the highest standard is immeasurably below the man of lowest standard." Here common-sense observation and all anthropological, psychological, and ethical investigations give him an emphatic negative.

Woman, then, according to Weininger, is nothing (*Nichts*), the complete antithesis of man, who is something, an ego, a microcosm (*All*), though containing within him the possibility of nothingness (*Nichts*), of chaos, of insanity, of crime. What, then, is her place in humanity? "Woman is sexuality, man is sexuality and something more." Here, then, we have the secret of woman. She is nothing but the instrument of a blind instinct to perpetuate the race; all her practical interests are in sexual congress (the courtesan type), in procreation (the mother type), in match-making. "The idea of pairing is the only conception which has positive worth for women." "The female is concerned altogether with one class of recollections, those connected with the sexual impulse and reproduction."

The women of history and of daily experience clearly cannot be fitted into Weininger's conception of them; but that, he would say, is because of their extraordinary capacity for assimilating man's ideas, his morality, his ideals of chastity, of honour, and his respect for logic. When a woman accepts man's standards too thoroughly her nature (sexuality) re-

volts, and hysterical crises result. The patient alternately passionately repudiates her sexual instincts and brazenly asserts them. It is hard to imagine how a creature without memory or logic could perform all the mental processes involved in this assimilation and repudiation.

Weininger now turns on man. Woman is nothing, and therefore non-moral, not immoral; but man in his relations with her is always immoral. For he always regards her as a means to an end, and not as an end in itself; in sexual congress as the instrument of pleasure and physical reproduction; in love as the instrument of self projection and mental reproduction; but woman is part of humanity, and must be regarded as an end in herself. The present writer, for one, fails to comprehend how a person who has no ego and is nothing can be regarded as an end in herself!

Specious and persuasive as our author shows that he can be, it is clear that he is very far from establishing his principle. The book is a remarkable one for the author's years—he was only twenty-one when he wrote it—remarkable in the learning and thought which he brings to bear no less than in the largeness of its conception and the breadth with which the matter is treated. It is brilliantly written, and contains at once profound reflections and almost laughably unfounded statements of fact. It is at times stimulating and suggestive, but, nevertheless, often irritating, because the central idea seems rather an obsession of a brilliant but inexperienced mind than a conception to which the writer has been driven by carefully considered facts.

Weininger died by his own hand in 1903, and we are told by the friend who collected his posthumous papers that he felt within him criminal tendencies, and could no longer continue the struggle between these tendencies (*Nichts*) and his intelligible ego (*All*).

L. A.

SOME RECENT LOGARITHMIC TABLES.

Tableaux logarithmiques, A et B. By Dr. A. Guillemin. Pp. 48 of explanation, with two tables 35 × 35 and 46 × 35 cm. (Paris: Félix Alcan, 1906.) Price 4 francs complete.

Clive's Mathematical Tables. Pp. 49. (London: University Tutorial Press, Ltd., 1906.) Price 1*s.* 6*d.*

Five-figure Mathematical Tables for School and Laboratory Purposes. By Dr. A. Du Pré Denning. Pp. 21. (London: Longmans, Green and Co., 1906.) Price 2*s.* net.

DR. GUILLEMIN'S two tables possess several interesting features. Taking, in the first place, Table A, which is used for working to six places of decimals, this contains the *antilogarithms*, calculated to six decimal places, of all decimals of three places from 0·000 to 0·999. In a third column are given the values of log α, corresponding to values of log $(1+\alpha)$, from 0·000000 to 0·000999. When it is required to calculate logarithms to six places of decimals, the principle employed is as follows:—Let N be the number the logarithm of which is required, m the nearest number in the column of antilogarithms, so that $\log m = \log N$ to three places of decimals. Then if $N = m(1+\alpha)$ we have

$$\log N = \log m + \log (1+\alpha).$$

By subtraction we find $N - m$, which is equal to $m\alpha$. From the tables we can find by inspection $\log m\alpha$ to *three* decimal places, and subtracting $\log m$, which is known, we have $\log \alpha$ to three decimal places. The table then gives $\log (1+\alpha)$ to three significant figures, and these figures are the second three decimals to be written after $\log m$ in order to give $\log N$ to six places.

In the second table (Table B) the values of the antilogarithms are given to nine places of decimals, and the values of $\log \alpha$ to six places. In each table the number of entries is one thousand, the logarithms going from 0·000 to 0·999. With Table B, which measures 35 cm. by 46 cm., it is possible to calculate any logarithm to nine decimal places, but the work involves something more than a repetition of the process used for Table A. If, for example, it is required to find log 7, there is no difficulty in obtaining the first six figures 0·845098, but the remainder to be operated on in order to find the next three figures cannot be got until we have worked the whole thing backwards and calculated the antilogarithm of 0·845098 to nine decimal places.

It is not often that logarithmic calculations have to be taken to nine decimal places, but if this has to be done the present method, which is very fully explained by the author, avoids the use of cumbersome books of tables, and it will probably be found, with a little practice, not to take much longer—perhaps not even to take so long as the interpolation methods which such books of tables would necessarily involve.

The other tables under review are good examples of a number of small tables which have been issued during the last few years with the object of saving elementary students in mathematics, as well as students in physics and chemistry, from the tedious work of looking out seven-figure logarithms in the large "Chambers." It has been felt for a long time past that working with four figures is sufficient for teaching purposes; on the other hand, the student of experimental science often requires the additional accuracy obtained by an extra decimal place. But though several cheap books of four-figure tables have been issued during the past few years, we had to retain "Chambers" for teaching and examining junior students until about four months ago, as none of the other books we saw contained what was necessary. One contained natural sines and cosines, but not their logarithms; another contained natural and logarithmic sines, but no cosines.

Junior students are very fond of using natural sines when they ought to learn to use their logarithms. They invariably get inaccurate results by clumsy methods, and it would not be a bad plan to remove the tables of natural sines from the books supplied for examinations.

The proper arrangement for a table of trigono-

metric logarithms is one which shows clearly the dual use of the tables for reading off the logarithmic sines of angles and the logarithmic cosines of their complements. With small books of tables this is best done by using the right-hand column and top line for logarithmic sines, the left-hand column and bottom line for logarithmic cosines. This is the arrangement adopted by Dr. Briggs in his "Clive's Mathematical Tables." The same arrangement is followed in regard to tangents and co-tangents. The tables of secants and cosecants are another desirable feature. By adding the logarithm of a cosecant instead of subtracting the logarithm of a sine, many compound expressions may be calculated by a single addition sum. It is a pity that logarithms of reciprocals are not also given. The tables are given to five places, and corrections are given in all of them where the differences are irregular. The explanatory matter is very useful to students, notably the definition of significant figures.

Dr. Denning, in his introduction, remarks that "Criticisms and suggestions for future editions will be welcomed." The first criticism which suggests itself is that a book where logarithms of numbers less than four *have necessarily* to be taken from a table of antilogarithms, and logarithms of numbers greater than four from a table of logarithms, is far too ingenious to put into the hands of a beginner. The object of this arrangement is, of course, to avoid the large and irregular differences that occur with logarithms of the lower numbers and antilogarithms of the higher ones. If the book is *not* meant for beginners the arrangement is good, but for teaching the use of tables the complete tables of logs. and antilogs. should be given, and students should be taught later on when to use each. The insertion of corresponding tables for obtaining logarithms of reciprocals is a good feature. It seems rather curious that no one has adopted the plan of bordering a table of antilogarithms with a bottom line and right-hand column containing the arithmetical complements of the numbers in the top line and left-hand column. Such an antilogarithm table would give logarithms of reciprocals very simply.

The arrangement of the trigonometrical tables is not very clear. There are no head- or footlines to the middle page, and while the columns look to run on from one page to the next, they do not really do so. The left-hand column of the first two pages goes from 0° to 15°, and we naturally expect to find 15° to 30° on the next page, but instead of that we find 30° to 45°, the entries for 15° to 30° being on the right-hand column of the first two pages. The misprint "co-functions" at the foot of p. 16 does not really introduce additional confusion. The book contains tables of squares and cubes for those who like to indulge in such luxuries. Pages of physical and chemical constants, electric units and data, together with some of the differentiation and integration formulæ also given, are really useful, and, finally, some "simpler mechanical relationships" and statements of the binomial and Maclaurin's theorems would be of greater value to the average student if they bore the heading "Things that Ought Not to be Learnt."

These criticisms do not preclude us from stating that the tables will be very useful to such science students as have learnt to find their way about in them.

GEOGRAPHY AS A LIVING SCIENCE.

Beobachtung als Grundlage der Geographie. By Prof. Albrecht Penck. Pp. 63. (Berlin: Gebrüder Borntraeger, 1906.) Price 1.60 marks.

THIS little work, which is choicely printed, is a record of a delightful personality. It contains the parting address of Prof. Penck to the students of Vienna, and his introduction to those of Berlin, now the suzerain-city of the land where he was born. The first words, "Liebe Freunde," ring very truly in our ears, and the title of the pamphlet recalls to those friends scenes in very many lands. Especially prized by the present writer is a little photograph—a mere imperfect sketch, if you will—in which Prof. Penck is seen writing up his notes in the open air, on the very edge of one of the world's great landscapes, where the scarp of the African tableland goes suddenly down towards the sea. Like his distinguished botanical colleague, Prof. Engler, Penck has realised the tradition of Humboldt, and has felt that the German people "darf sich in geographischer Arbeit nicht auf sein Gebiet beschränken, es muss solche auf der ganzen Erde leisten" (p. 60).

The striking contrast of geographical position makes it necessary to urge the claims of travel more strongly in Berlin than in Vienna. The romance of Vindobona and Carnuntum, of the Germanised city facing the great "Kessel, in den sich Völkerwoge auf Völkerwoge stürzte," calls us eastward in the first few pages, and we ask ourselves, What has Berlin to offer after this? In the last pages, however, we meet our answer—Germany centres in the flat land of Berlin, but Germany has spread her wings. Near the North Pole lies King William Land, near the South Pole lies Emperor William II. Land, and the union of the German States has allowed all Germany to look towards the sea. On this medium, which no longer divides but joins the continents, we trust that ships may bear in all directions the students of Berlin, imbued as they cannot fail to be with the high and genial spirit of their master.

In the Austrian section of the pamphlet, Prof. Penck shows how tectonic geography has specially developed in Vienna. He urges, however, that the relations between internal structure and surface-features are not always so close as has been supposed. The forms associated with the higher regions of the Alps are thus due less to the recent folding of the chain than to the surface-action of the glaciers of the Ice age and of modern times (p. 16), which continuously carry away, by a nibbling action, fragments from the valley-walls. The author believes that the Alps were far more rounded before the advent of the Ice age, though they possessed (p. 20) a much

dissected Flysch-zone, and that the contrast between the surface of the young folded chain and that of the old "Rumpf" of Bohemia is in reality a development of fairly recent times. The Alps, moreover (p. 18), appear to have gained in height, by a vertical movement, since the formation of the interglacial lakes, and thus their present preeminence is not to be ascribed to lateral thrust alone.

The uniformity of level of peaks in the same district is then discussed, and it is argued that the cutting of valleys in a mass undergoing denudation influences the heights of the peaks along the valley-walls. After a long time, where the hardnesses of the rocks concerned do not greatly vary, the upstanding points at any given distance from the centre of the chain will tend to be reduced to much the same level above the sea, and the impression given will be that they were originally points on a continuous dome. It is clear that the author here asks us to be cautious in applying the fascinating doctrine of the "peneplain" and of subsequent elevation to every dissected highland.

The consideration of the post-Pliocene uplift leads us on to the vigorous and partly post-Roman depression of the Adriatic region, with the compensating elevation of the Apennines; then follows a survey of river-courses in central Europe. The movement of masses of land in vertical blocks, to which geomorphological studies in the Alps have directed attention (p. 36), is shown not to be inconsistent with horizontal movements, and with folding, where one block rides over another (p. 34). The relative importance of vertical movement and horizontal thrusting, and how far the one may be a manifestation of the other, are left as problems for the future.

So far, the results of recent observation, geographical it may be, but with a remarkably geological trend, have been summarised for the region of which Vienna is the natural centre. A few words in praise of observational research conclude this section. The title of the pamphlet is, however, really justified in the discourse to the students of Berlin, which opens with a somewhat depressing picture of their natural environment. Men, not mountains, have made the greatness of the geographical school of northern Germany. Prof. Penck contrasts the influence of Karl Ritter, who regarded the earth from the point of view of its suitability for man, with the later and more scientific attitude of von Richthofen. In each case the geographical outlook depended on the stage reached contemporaneously in the development of scientific thought. Ritter expressed (p. 47) the teleological views of his time; Richthofen "nimmt die Erdoberfläche nicht als gegeben, sondern als geworden, naturgemäss daher bei ihm die enge Fühlung zwischen Geographie und Geologie." Followers of Richthofen should insist on being observers, not mere critics and coordinators. Modern means of communication have made travel a matter of money only, instead of both time and money, as in bygone years. The small scale of the maps of the more recently explored countries masks the immense amount of work that is waiting to be done, and the district adjacent to a colonial railway station may well reward the student who goes out skilled in observation. With such stimulating words Prof. Penck enters on his new province in Berlin, and he may be sure that his friends in the four corners of the world will welcome those whom he has trained.

GRENVILLE A. J. COLE.

THE STRENGTH OF MATERIALS.

Text-book on the Strength of Materials. By S. E. Slocum and E. L. Hancock. Pp. xii+314. (Boston and London: Ginn and Co., n.d.) Price 12*s.* 6*d.*

THIS book is intended to provide for the needs of engineering students both in the class-room and in the laboratory; hence it is divided into two parts, the first part treating of the theoretical side of the subject and the second dealing with the experimental side. The first two chapters are devoted to a general discussion of the relations between stress and strain as an introduction to the development of the more special rules applicable to the structural forms in common use by engineers and architects. There is an unfortunate slip on p. 10 in the paragraph dealing with the fatigue of metals; in quoting some of the results obtained by Bauschinger in his experiments, the material is stated to have been "cast iron"—it was, of course, "wrought iron." Chapters iii. and iv. deal with stresses and strains in beams, and there are two useful constructions not usually found in text-books on this subject, namely, a graphical method of finding the centre of gravity and the moment of inertia for a rail, or other similar section, and a graphical solution of the problem of finding the moment of inertia of a reinforced concrete beam of rectangular cross-section.

In dealing with the flexure of beams in chapter iv., the problem of continuous beams is fully discussed, and, in addition to the method of three moments, other methods of solution of the problem, based on Maxwell's theorem and on Castigliano's theorem, are explained.

In the next two chapters the design of struts and shafts is dealt with, also the theorem of helical springs, but there is nothing novel in the treatment of any of the problems which have to be solved.

In the chapter which treats of the strength of spheres and cylinders under uniform pressure, a neat formula is obtained for the critical pressure just preceding collapse in the case of a hollow circular cylinder subjected to external pressure, and Lamé's formula for thick cylinders is deduced.

Two subjects—flat plates and hooks—which in most of the text-books are usually treated in a somewhat unsatisfactory fashion are thoroughly investigated in chapters viii. and ix.; in the case of crane hooks it is pointed out that the ordinary assumption that the distribution of stress is the same as in a straight beam subjected to an equal bending moment and axial load is not even approximately correct. From an analysis of the stresses in a curved piece subject to pure bending strain, a general formula for

the case of a crane hook is deduced, and the method of Résal is explained by which the application of the formula is much simplified. The last two chapters of this section are devoted to arches and arched ribs, and to foundation and retaining walls; this is a part of the subject of the strength of materials which generally proves a great stumbling-block to the engineering student, and the authors are to be congratulated on the lucid and thorough fashion in which they have set forth the various solutions which have been found most satisfactory for problems which have been well-known subjects of controversy among engineers and mathematicians for a century or more.

The six chapters of part ii. are devoted to the physical properties of materials and the most modern methods of determining accurately the various physical constants required in the formulæ of part i. Typical testing machines are illustrated and explained, and the various types of apparatus in general use for measuring the stresses in the material undergoing test are described. The materials dealt with include iron and steel, reinforced concrete, and the other building materials employed by engineers and architects; a number of useful tables are given, and also the standard specifications proposed by the American Society for Testing Materials.

The authors have succeeded in producing a new English text-book in which the important subject of the strength of materials, the foundation upon which the whole structure of engineering science is based, is treated in a far more complete and thorough fashion than has been the case in the majority of the text-books hitherto available to the engineering student, and certain sections of it should prove of great service to those who are actively engaged in engineering design.

SCIENCE IN POETRY.

Nature Knowledge in Modern Poetry. By Alexander Mackie. Pp. vii+132. (London: Longmans, Green and Co., 1906.) Price 2*s.* 6*d.* net.

IN this book the author deals in a very interesting manner with the many references to the aspects of nature in the poetical works of Tennyson, Wordsworth, Matthew Arnold, and Lowell.

We find these poets taking delight in alluding to animated nature in many different ways. Not only do flowers, trees, and foliage of all kinds occupy a prominent place in their poems, but animal life figures almost as importantly, birds more especially.

Tennyson's references to horses and dogs show an intimate knowledge of these animals, though they do not convey the spirit of one in the habit of taking part in sport; and the author points out that Tennyson was not a sportsman. Matthew Arnold's love of dogs is also very obvious, and his poems show how much sympathy he had with them, and what a close observer he was of their ways and habits. This comes out more especially in the poems dedicated to his household pets.

Interest in the insect world is shown to a greater extent by Tennyson, for he alludes to it frequently, and always with the accuracy which reveals great knowledge. Lowell refers more especially to the bee.

Love of bird life is common to all these poets, but it is worthy of note, and also pointed out by the author, that the great characteristic of Tennyson's work is that he describes the bird's *notes* to a great extent, and has the happy knack of so doing that the bird he is referring to is unmistakable.

We gather in many ways that Tennyson was the more truly scientific man of the poets referred to. The character of his allusions and the accurate detail into which he goes are, moreover, beyond the knowledge of the casual observer. Wordsworth was more an esctatic admirer; as the author tells us, "his outlook was broader, and in one sense less intimate" than Tennyson's. He was accurate in his descriptions, but seemed almost fearful lest an intimate knowledge should do away with the beauty and poetry of nature. He says,

> "Sweet is the lore which Nature brings;
> Our meddling intellect
> Misshapes the beauteous forms of things;
> We murder to dissect."

And again,

> "Enough of Science and of Art;
> Close up those barren leaves;
> Come forth and bring with you a heart
> That watches and receives."

In the preface to "This lawn a carpet all alive," Wordsworth appears a little more in sympathy with science, but in spite of this he still conveys the feeling that he is of opinion that nature will reveal her mysteries unsought.

Tennyson's love of geology is apparent in the frequent references to it and the similes he gives, which clearly show he must have read a good deal on this as indeed on many other less popular subjects; for instance, he does not shun allusions to the nebular hypothesis, spectrum analysis, and astronomy. It seems evident that he accepted the theory of evolution, for many quotations might be made to show it; but the author contents himself with the following, from "Locksley Hall Sixty Years After":—

> "Evolution ever climbing after some ideal good,
> And Reversion ever dragging Evolution in the mud.
>
> * * * * * *
>
> Many an aeon moulded earth before her highest, man, was born,
> Many an aeon too may pass when earth is manless and forlorn."

We see, therefore, that these poets deal largely with things of scientific interest, and all lovers of nature will find the book of great and permanent value.

OUR BOOK SHELF.

Geometrische Kristallographie. By Ernst Sommerfeldt. Pp. x+139; illustrated. (Leipzig: W. Engelmann, 1906.) Price 7*s.* net.

THE closing decade of the last century witnessed much progress made in the development of the geometrical theory of crystal structure, and we may now have confidence in the certainty of our knowledge regarding the possible types of crystalline

symmetry. This advance has not been without marked influence on the methods of determining the physical properties of crystals. The old idea to consider a crystal as a solid bounded by plane faces, the relative positions of which harmonised with Haüy's law of rational intercepts, is giving way to the more logical principle that a crystal consists of a homogeneous arrangement of discrete particles in space. Indeed, as has been frequently pointed out, a theory which ignores the internal structure cannot avoid the difficulty presented by a peculiar case of pseudo-trigonal symmetry. To the new school, which is typified most completely by Schönflies's well-known treatise, the present work belongs.

Dr. Sommerfeldt devotes a considerable portion of his book to the determination of the thirty-two classes of crystal symmetry. He establishes the four possible types of axes of symmetry in the usual way, and proceeds to evolve the classes in the following order:—the holohedral groups; the merohedral groups, comprising those possessing centres of inversion, those without such centres, but having mirror-image symmetry; and, lastly, those without such centres, and enantiomorphous. In the discussion a modification of the "Fundamentalbereich" of Schönflies is introduced. It is the smallest spherical triangle defined by the elements of symmetry. The symmetry pertaining to each class and the shape of typical simple forms are clearly illustrated by means of the admirable plates, of which there is one for each class except that devoid of symmetry. After a brief discussion of the zonal law and the linear and stereographic projections, the author proceeds to what he considers not the least interesting portion of the book, namely, the application of the methods of vector analysis to crystallography. This form of mathematical analysis is undoubtedly graced by elegance, and presents the generalised formulæ in neat guise, but its unfamiliarity to the ordinary student of crystallography seriously militates against the general utility of the book. The formulæ in question —some of which, by the way, do not lend themselves readily to arithmetical computation, and are, therefore, not of immediate practical use—could be established without greater difficulty by means of ordinary analytical geometry. Nevertheless, to the advanced student who may be versed in mathematics it would be interesting and stimulating to study a different method. The book concludes with a very complete bibliography and a good index.

Untersuchungen über künstlichen Parthenogenese und das Wesen des Befruchtungsvorgangs. By Prof. Jacques Loeb. German edition, issued with the author's cooperation, by Prof. E. Schwalbe. Pp. viii+532. (Leipzig: J. A. Barth, 1906.) Price 7.50 marks.

THE greater part of this remarkable book appeared in English dress in the Decennial Publications of the University of Chicago, and has been already noticed in our columns. As is well known, Prof. Loeb set himself some years ago the task of discovering chemical or physical methods of stimulating development in unfertilised eggs. Taking every precaution which he could conceive of, he has been able to induce artificial parthenogenesis in the ova of sea-urchins, of the annelid Chætopterus, and of the gasteropod *Lottia gigantea*. He thinks that the list will be added to as our mastery of the technique increases, for he does not believe that there is any essential peculiarity in those ova which develop in response to the artificial stimulation. As to the nature of the stimulation, Loeb is more and more convinced that it depends on setting-up or increasing oxidation processes in the ovum, and also on the synthesis of nuclein substances from the protoplasmic materials. It is possible, he says, that the two processes are interdependent, and that oxidative syntheses take place. Everyone will wish more power to this ingenious experimenter's elbow in his untiring efforts to gain control of life.

Handbook of Metallurgy. By Dr. Carl Schnabel. Translated by Henry Louis. Vol. ii. Second edition. Pp. xvi+867; illustrated. (London: Macmillan and Co., Ltd., 1907.) Price 21*s.* net.

PROF. LOUIS is to be congratulated on the completion of the translation of the second edition of Dr. Schnabel's great work. Little delay has been experienced in placing it in the hands of English metallurgists, as the corresponding German edition was not published until 1904. The volume which has just been issued contains the metallurgy of zinc, and shorter sections on cadmium, mercury, bismuth, tin, antimony, arsenic, nickel, cobalt, platinum, and aluminium. As the first edition appeared nine years ago, there have been great advances in the metallurgy of some of these metals since it was written, and these have caused many alterations and a considerable enlargement in the present volume. The changes are distributed throughout, the whole text having been carefully revised, but some of the most striking changes occur in the sections devoted to the production of aluminium on a large scale and to the electrolytic treatment of zinc. Electrolytic methods generally are fully treated, the author expressing his indebtedness to the works of Dr. Borchers for much of this part of the book.

There is little to be said in criticism of Dr. Schnabel's book. The description of alloys is usually rather meagre, with curiously slight regard to the work of the last twenty years. Then, again, the rapidity with which the Silesian zinc furnace is giving place to the Belgo-Silesian furnace does not seem to be realised by the author. In general, however, the information is full, accurate, and up to date, and is conveyed in a pleasant, readable manner.

LETTERS TO THE EDITOR.

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The Inoculation Accident at Mulkowal.

I SHOULD like to direct the attention of your readers to this matter. The evidence regarding the unfortunate Mulkowal accident, as given in the *Lancet* and the *British Medical Journal* for February 2, and in the *Journal of Tropical Medicine* for February 1, shows that on October 30, 1902, nineteen persons were inoculated from a single bottle of Haffkine's prophylactic labelled 53N, while numerous other persons were inoculated from other bottles. A week later all the nineteen inoculated from bottle 53N developed tetanus, and subsequently died, while none of the others suffered at all. This gives a strong argument in favour of the view that the poison was associated with the contents of that particular bottle; but the evidence is clearly not mathematically absolute even on this point, while it gives no indication whatever as to when the tetanus bacillus entered the bottle. It might possibly have entered during the processes of manufacture and bottling, or later through a loosened cork, or in several ways during the opening of the bottle and the inoculation of the contents. But the commission that was appointed to consider the subject seems to have somewhat hurriedly adopted the conclusion that it actually entered during preparation, and not later. Mr. Haffkine, as head of the laboratory, was

blamed, especially because he had omitted, for good reasons, to add carbolic acid to the prophylactic. Great alarm was produced. The idea that the poisoning was due, not to local accident, but to carelessness at the laboratory, caused, I have been told, a sudden and wholesale rejection of the invaluable vaccine by the people, with the probable result that thousands of lives may have been lost from plague.

Now it appears that the tetanus bacillus could not have entered the bottle at the laboratory at all! I agree with Prof. Simpson (*British Medical Journal*, February 9) in thinking that the arguments on this point are extremely strong. Had the contents of the bottle been polluted at the outset, they would have had a very offensive smell when used some time later, and would have produced a very rapid infection in the inoculated. As a matter of fact they had no smell, and produced a slow infection, while bottles filled simultaneously were quite sound. Moreover, evidence has been given tending to show that the prophylactic was polluted during the opening of the bottle. On what grounds, then, were the laboratory and its director indicted? Even if the bacillus had entered during the complicated process of manufacture, the blame can hardly be attached to the director, who cannot himself superintend the preparation of each bottle. As for the omission of the carbolic acid, the inventor of the prophylactic was himself surely the best judge of how it was to be made.

The serious part of the affair seems to lie, not so much in the loss of life due to the accident itself, considerable as that was, but in the much greater loss which probably followed the suspicion thrown upon the prophylactic by the apparently erroneous judgment of the commission, and, more even than this, in a certain ingratitude shown in India to a man who is one of the very greatest benefactors it has ever had. Haffkine not only elaborated the method of immunisation by dead culture, but, where many a man of science would have contented himself with merely writing an article on the subject, he addressed himself, on the contrary, to the much more difficult practical verification. I well remember when he arrived in India with his anti-cholera vaccine and by his energy and perseverance gradually forced his ideas upon the people and the Government. When the frightful calamity of the plague overtook the country in 1896, largely, in my opinion, owing to the inadequacy of the sanitary organisation and to want of firmness and resolution in the authorities, when measure after measure failed and the people were dying by hundreds of thousands, then Haffkine was the only one who made any successful stand at all against the storm. Quickly inventing his anti-plague prophylactic and forcing the authorities along with him, though he could not control the disaster, he at least checked it by saving thousands, if not hundreds of thousands, of human beings, who now owe their lives solely to him. The fact that more than six million doses of the prophylactic have been issued in India alone attests the success and magnitude of his work. Yet he has received for it less than nothing. For services which compared with his are really of a trifling nature, all kinds of officials receive in many cases pensions, promotion, and decorations. As for him, not only has he received no adequate recognition for his immense service, but he has been blamed for an accident which could not have been due to his fault, and it is doubtful whether he will ever return to a country which has treated him—I can only say—so ungratefully. Contemplating this history, we cannot help being filled with indignation at it. India seems to be becoming quite notorious for its treatment of scientific workers, suggesting ignorance both of science and of the importance of science. I remember the persecution suffered by Colonel King as the result of his work on vaccination, the complete want of gratitude shown to Mr. Hankin for his great work on the prevention of cholera, and several similar cases. While all kinds of people climb easily into the seats of honour, it seems that the men of real merit are fortunate if only they can escape without censure.

I think I shall be excused for writing somewhat strongly on a subject on which I have long felt still more strongly, and on which I have reason to know many others feel as strongly as myself without being as free as I am to express their opinions. It appears to me a foolish thing for a nation to treat great men as we have sometimes treated ours, and the case of Mr. Haffkine—to whom, as he is a foreigner, we are doubly bound to show national gratitude—seems to be a glaring example of such treatment. I hope that steps will be taken to press upon the India Office the need for a reconsideration of the affair; the reputation of the whole country is concerned in it.

March 19. RONALD ROSS.

Mean or Median.

THE article by Mr. Francis Galton in your issue of March 7, entitled "Vox Populi," is exceedingly interesting, and the variations in the estimates of individual competitors afford an admirable instance of the advantage to be derived from the use of the weighbridge at live-stock markets in preference to buyers and sellers relying on their own judgments; but the letter raises several interesting points as to the theoretical treatment of statistical data, to two of which I should like to allude.

In the first place, as to bias. No doubt, in estimating carcase weights in such a competition as that referred to by Mr. Galton, each competitor judges as truly as he can. But has a butcher (buyer) had his judgment to any extent warped in the course of years through having constantly had to judge of the weight of a beast (when buying) so as to be on the safe side, and secure himself from loss in the event of its not cutting up so well as he anticipated? If so, it might be expected that buyers would have an instinctive tendency to under-estimate the weights of animals; and similarly farmers (sellers) might be expected to over-estimate. This tendency, on either side, should, of course, not be large, as constant intercourse between buyers and sellers has raised such transactions almost to the point of a fine art. I should therefore like to ask Mr. Galton whether he has any information showing the proportion of these 787 competitors who were farmers and butchers respectively. It is very interesting to observe, from the figures given, that the estimated weights at each decile are throughout the whole series invariably below the weights which might be anticipated from the normal law of error. This rather looks as if buyers were in a majority in this competition: a not impossible suggestion, since, although farmers doubtless attend such exhibitions in larger numbers than butchers, yet the latter would, in a weight-judging competition, probably be more numerous than the former, at least relatively, if not actually.

The second, and more important, point to which I desire to direct attention is the use of the median in this connection, and I could wish that Mr. Galton had also calculated the arithmetic mean of the 787 observations. I should, in fact, like to strike a note of hesitation in regard to the too general use of the median in preference to the mean. The former has several advantages, one of which is that it is a form of "average" which can be very readily calculated. It is also very useful in cases such as those referred to in Mr. Galton's letter in NATURE of the preceding week, where it is desirable to eliminate one or two "cranks" whose opinion might have undue weight among a relatively small number of other opinions—in cases, in fact, where the distribution of opinions is known to be very erratic. But is this the case here? I am not sure that Mr. Galton is quite right in regarding the present instance as a case of "vox populi" at all. It is to be remembered that the great bulk of the trade in English cattle—and consequently the determination of the price of our native beef—is the result of transactions such as the competition in question is intended to test. Cattle are practically sold by inspection, and the judgment of buyer and seller as to how much beef there is in a given ox is really much more a matter of skill than of popular judgment; their livelihood depends upon the accuracy of such judgments. In such circumstances, is the median a nearer approximation to the truth than the mean? Here the question could be answered by calculating the arithmetic mean. I have not the actual figures, but judging from the data in Mr. Galton's article, the mean would seem to be approximately 1196 lb., which is much closer to the ascertained weight (1198 lb.) than the median (1207 lb.).

I should accordingly like to ask Mr. Galton whether he would indicate what, in his opinion, are the chief considerations to be taken into account in giving preference to the mean or the median as the better measure of the "average"? It is a point upon which there is considerable difference of opinion; the recognition of the median is rapidly extending, and some statisticians incline to think that there is a growing tendency to quote it in cases where the ordinary arithmetic mean is preferable.

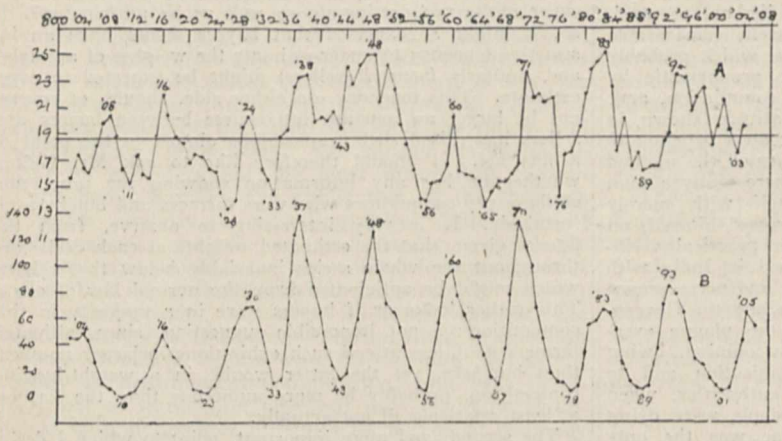
March 16. R. H. HOOKER.

Rothesay Rainfall and the Sun-spot Cycle.

THE rainfall of Scotland has been thought to show, in its variations, an influence of the sun-spot cycle of eleven years (in the sense of most rain about maxima). Evidence of this was furnished not long ago by one of our ablest meteorologists, Dr. Buchan, in a paper to the Scottish Meteorological Society (Journal, 3 ser., Nos. xviii.–xix., p. 117).

For such an inquiry the record of Rothesay, in Bute, is singularly valuable, extending back as it does to the year 1800 in unbroken series.

The relation to the sun-spot cycle may be traced, I think, not only in the total annual rainfall of Rothesay, but also, with more or less distinctness, in the amounts for certain sections of the year, and even individual months.



A, Rainfall July, Rothesay, 1800–1906; smoothed with sums of *five*; B, sun-spot curve.

Thus it is met with in the rainfall of summer, and especially that of July.

I have prepared a curve of the July rainfall (A), in which, by a familiar method, each year-point represents the rainfall of five contiguous Julys (*i.e.* 1800–4, 1801–5, and so on). Below is the sun-spot curve (B). The amount of correspondence between these two seems remarkable, and not easily explained by fortuitous coincidence.

ALEX. B. MACDOWALL.

The Relationship between Diamonds and Garnets.

IN an able paper entitled "The Diamond Pipes and Fissures of South Africa," read before the Geological Society of South Africa rather more than a year ago, Mr. H. S. Harger refers more than once to the significance of the fact that diamonds have been found embedded in garnets. Perhaps the fact that the converse is also true, namely, that the garnet sometimes occurs embedded in the diamond, may not be without its share of interest. I have here at the present time a fragment of a Wesselton diamond, weighing a little more than a carat, containing a small, irregular garnet of about one-tenth of a carat. Originally the fragment seems to have formed a part of a shapeless diamond of perhaps two carats, which evidently enclosed either two or three small garnets, or garnets and diamonds. J. R. SUTTON.

Kimberley, South Africa, February 20.

THE WEATHER REPORTS OF THE METEOROLOGICAL OFFICE.

THE commencement of the new year was marked by the introduction of a number of changes in the weather reports of the Meteorological Office.

Two notable events have contributed to bring about modifications in the daily report. Arrangements have been made for regular telegraphic reports from Iceland, and for occasional reports by wireless telegraphy from the ships of the Navy.

Thanks to the Danish Government and the Great Northern Telegraph Company, the cable to Faeroe and Iceland, long desired by meteorologists and fishery associations, was laid in the summer of last year. There is a touch of sadness in the reflection that Adam Paulsen, director of the Danish Institute, who led the way so assiduously towards this meteorological Canaan, only got a distant view of the promised land. In August, 1906, he issued a circular on behalf of the Danish Government, defining the terms of subscription for the service of meteorological telegrams from Iceland, but, as already reported in NATURE, he died before the arrangements were completed.

Reports from Thorshavn in Faeroe and from Seydisfjord, on the east coast of Iceland, have been received in London, in a provisional way, since the end of October, but the meteorological telegrams from Reykjavik, on the west coast, commenced on Friday, February 15, as part of the full system which includes messages from Blönduos and Akureyri, where the land line touches the northern fjords, and Grimstadir, between the last-named place and Seydisfjord, where the cable lands. The meteorological arrangements are not complete even yet, for the reports do not conform to the established international model, either in uniformity of the hour of observation or the extent of the information transmitted; but those who have seen what the new information means for the weather map of north-western Europe, what light it throws upon the meteorological situation of the northern Atlantic, will appreciate the satisfaction that is felt with the result of the negotiations even in their present stage. Paulsen has indeed carved for himself a memorial *aere perennius* upon the winds and weather of the stormy northern island.

It is to the Lords of H.M. Treasury that we owe the realisation of this long-cherished project so far as this country is concerned. It need hardly be said that the cost of the new service is very considerable. Their lordships have undertaken to ask Parliament to increase the grant for meteorology from 15,300*l.*, the figure at which it has stood since 1882–3, by 200*l.*, and the greater part of our share of the expenses for Iceland telegrams is thus provided for.

In order that the new information may be incorporated in the daily weather report the area of the charts has been extended to a more western longitude than hitherto, and the occasion has been utilised also to take in an area as far south as Gibraltar, and to meet a wish, often expressed, that a barometric chart of the 6 p.m. observations of the previous evening should be given. This appears as an inset chart on the same scale as "yesterday's" 8 a.m. chart for the whole of Europe, side by side with the 8 a.m. chart for "to-day." But six o'clock observations

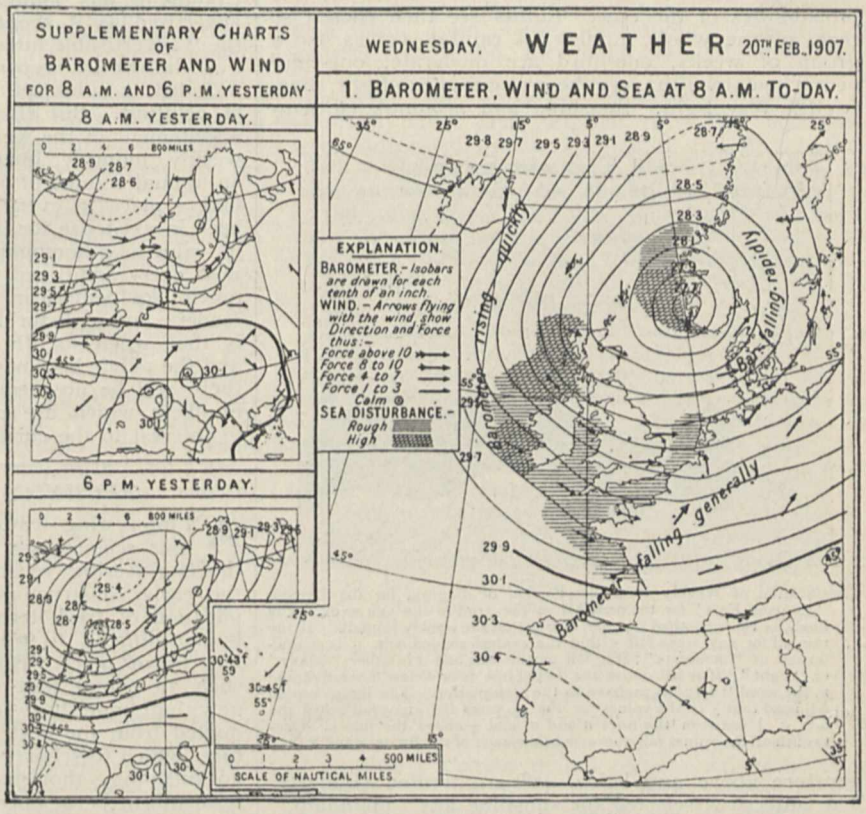
are only received by telegram from western Europe, and the eastern portion of the map would always be blank. Advantage is taken of this misfortune to get a western extension of the lower part of the 8 a.m. barometric chart, and thus provide for the observation from the Azores, for which we are indebted to Major Chaves and the Portuguese Government. It happens that the eastern point of the Azores and the western point of Iceland lie close to the meridian of 25° W. and it is a matter of importance to get observations from both these "centres of action" on the same chart. The bringing of Iceland into touch with Europe by the new telegrams emphasises the isolation of the Azores, and the chart is a pathetic appeal for the extension of the area to be reached by wireless telegraphy. But in the meantime the daily problem of drawing isobaric lines to connect the Azores pressure readings with the European and North Atlantic distribution affords an intellectual exercise which would bear comparison with some subjects of competition judged worthy of valuable prizes.

In order to represent the new arrangement of p. 2, the barometric charts for the issue of February 20 have been reproduced, completed for observations missing on the day. They show the development of the storm which caused the *Berlin* disaster at 6 a.m. on February 21.

The extensions of the daily charts have been carried out without sacrificing any of the information hitherto given on the inner pages of the daily report, except the map of weekly results which has occupied a place on p. 2 for some years. On p. 4 the table of hours of observation has gone to make space for wireless telegrams, for which arrangements have been made through the courtesy of the Lords of the Admiralty Only two messages have appeared as yet, but they have been enough to show that the system, which needs careful organisation in order to avoid disastrous results arising from instrumental or telegraphic errors, is capable of satisfactory working.

The weekly report has been enlarged by two additional pages. The new features introduced last year have been continued. They include temperatures on the grass and in the ground, from a considerable number of stations, and observations in the upper air contributed by Mr. W. H. Dines from his new station at Pyrton Hill, Oxon., Mr. C. J. P. Cave of Ditcham Park, Mr. S. H. R. Salmon of Brighton, and Mr. J. E. Petavel, for the physical laboratory of the University of Manchester, working at Glossop Moor. To these have now been added a table of temperatures of the sea, at coastguard stations and elsewhere on all coasts. No one doubts the influence of the sea temperature upon the climate of this country, but few attempts have been made to deal with the numerical results. The tracing of the relation of sea temperature to the incidence of sea fog is the direct object of the new departure in obtaining the readings weekly instead of monthly as hitherto.

But the most important addition to the report, although it makes little show, is on the new front page. It is the first result of an attempt to deal with climatological work from the point of view of frequency distribution. The weather of the week for each of the twelve districts of the British Isles as regards warmth, rainfall, and duration of sunshine is characterised by a selection of adjectives for each element. To do this the results for the current week have to be referred to the mean values for the corresponding week which are smoothed to give appropriate averages "for the time of year." The trouble is to define the characteristics of a week in such a way that when the weeks of a particular kind



Form of the new Daily Weather Report of the Meteorological Office.

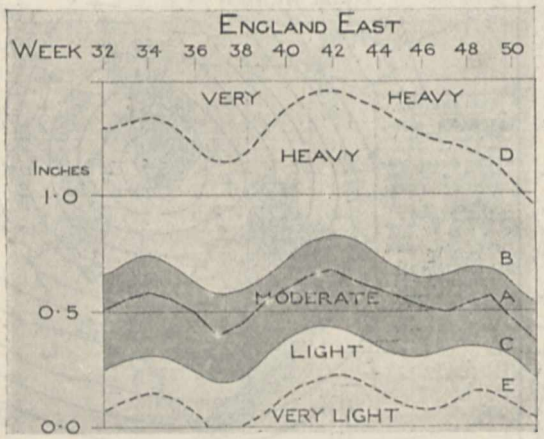
come to be counte for a season or a year, the result shall not be misleading. This seems at first sight an easy matter, but the frequency distribution of the values of the elements introduces a difficulty that is curious and interesting.

Take as an example the rainfall in a district like that of the eastern counties. The mean value for the week is by no means the most frequent value. The commonest kind of week is one with very little rainfall and the frequency of weekly falls of successive intensities is less and less until we come to rare weeks of very heavy rainfall. The mean rainfall belongs to a group which is comparatively infrequent Consequently, if we call a week with less than average rainfall a dry week, and it seems at first sight reasonable to do so, we shall find that in an ordinary season most of the weeks appear as dry

ones, and they are balanced by the heavy rainfall of a few wet weeks.

Thus in characterising weeks for counting it is necessary to deal with probable frequency of occurrence as well as with the relation of the week's fall to the average depth of rain. Frequency results are most easily expressed by odds. It has been sought to determine limits for a week of so-called "heavy" rainfall, so that the odds are two to one against its occurrence, and the same for "light" rainfall. Further, "very heavy" rainfall has been so defined that the odds are eleven to one against its occurrence, and "very light" in a similar way.

To determine the limits for these odds the weekly values for the twelve districts for the twenty-five years 1881 to 1905 have been dealt with. Smoothed mean values for each week have been obtained, and frequency results for groups of six or seven weeks, to get a sufficiently large combination of values to make the odds a reasonable representation of the probabilities of the case. Limits are then chosen so that, of the whole number of rainfall values for a group of weeks, one-third are moderate, one-third heavy, one-twelfth very heavy, one-third light, one-twelfth very light. Sunshine and accumulated temperature above and below 42° are treated similarly. The adjectives selected for sunshine are "abundant" and "scanty," and for warmth "unusual" and "deficient."



Classification of Weekly Rainfall.—Portion of diagram for the District "England East" for the period from the 32nd to the 51st weeks. The line A is the smoothed 25-year average of the weekly rainfall. If the rainfall for any week fall within the central shaded belt, it is characterised as "moderate"; if it fall outside this belt it is either "heavy" or "light"; if it fall above the dotted line D or below the dotted line E, the word "very" is prefixed to the designation. The limits are so adjusted that ⅓ of the values for the 25 years 1881–1905 fall below the line C, ⅓ between the lines B and C, and ⅓ above the line B. One-twelfth of the values fall above or below each of the limits D and E.

The work necessary for obtaining these limits has been very heavy, but incidentally a number of interesting points about the weekly values for the elements in the several districts and the frequency distributions have been disclosed which will be the subject of an official publication on the seasons in the British Isles.

The monthly report which began with the January number, issued at the end of February, shows less change than was anticipated at one time. Negotiations were initiated with the view of making it a complete index of climatological work for the British Isles, to contain a line of data for each station contributing observations to the Meteorological Office, the Royal Meteorological Society, and the Scottish Meteorological Society. At present the three bodies collect and publish observations independently; but if a joint publication could be arranged, any person requiring climatological data would be able, by reference to a single publication, to know what information was in existence and where it was to be obtained. Unfortunately difficulties arose which could not be overcome in time, and as regards climatology the Report for 1907 is limited to the 170 stations in direct or indirect connection with the office. But Dr. H. R. Mill, the director of the British Rainfall Organisation, has expressed his willingness to contribute a rainfall map of isohyetal lines based on the monthly results for about 500 stations in the British Isles, and in the current issue this replaces the map showing rainfall values at the 170 stations which have always been regarded as too few for drawing isohyetal lines.

It ought, perhaps, to be added, as regards the daily weather report, that it is prepared and printed at the public expense, and is sent free to anyone who pays the cost of postage, wrappers, and addressing. Complaint has sometimes been made that it is not advertised as it should be, but as a matter of fact the "advertisable interest" rests with the Post Office. For the weekly report, with which the monthly is included, a subscription is charged to meet the cost of printing. But this report gives so compendious a statement of the weather in the British Isles, daily, weekly, monthly, quarterly, annual, and average, in an annual volume of about 450 pages, that it ought to find a place in every reference library. It has now been in existence for more than twenty-five years, and its value as a homogeneous body of statistics increases with every additional year. Its weekly pages are too much like pemmican to be attractive to the general reader; but a disturbing reflection about the matter is that when its life has continued for fifty years, and the public becomes educated to appreciate its uses, there will be no means of meeting demands for the numbers which are now regarded as being merely of interest to the curious meteorologist.

TECHNICAL TERMINOLOGY.

AN interesting feature of the progress of engineering science has been the gradual formation of the engineering vocabulary. Ever since the days of the early constructors there has been a steady application of fresh terms to technical practice, and it is not difficult to trace the methods by which this has taken place. But the process has operated to such an extent that what could almost be called a new language has arisen, and specimens could be quoted from the best examples of engineering literature which to scholars of a century ago would convey no meaning, though the origin of each individual term might be at once apparent to them.

Some of these terms have interesting histories by reason of the changes of sense they have passed through. The word "skid," for example, was originally the name of the buffer rope hung over a boat's side to protect it from injury. It was then applied to the shoe placed under a wheel to brake the motion of a carriage, and finally it was turned into a verb to express the vagaries of vehicles in muddy weather. "Switch," first applied in railway practice and connected with the peculiar motion of the bar so named, was passed on to electrical machinery. The "salamander" is a newt of a kind supposed, according to an old legend, to be capable of living in fire. The newt, surrounded by his flames, is sometimes seen in heraldry, and from this source it was applied to certain kinds of foundry irons and crucibles. "Splay" is borrowed from architecture, and in its original sense means an obliquity or bevel edge. The bevel edge is frequently used to expose some interior part, and hence the

origin of the term, which is simply a contraction of "display." The "tender," or attender, of the vessel or locomotive, and the "tender" supplied by the contractor, though of such different meanings, are derived primarily from the same Latin word, meaning "to reach out." On the other hand, the verb "fuse" comes from the Latin, meaning "to pour," and the noun "fuse," together with "fusee," from a word meaning "spindle." It is interesting to note that several words, such as magnetic, type, amalgamate, wire, and cable, have been borrowed from the technical vocabulary and applied to the language of ordinary affairs, and no doubt as mechanical appliances enter more and more into the essentials of social existence this process will be increasingly carried on. Perhaps the most interesting history of all is that of the word "pole," as used by electrical engineers. Its original is a Latin term meaning simply an axis of rotation. From this it has been applied to the particular axis on which the earth rotates, thence to the two points on that axis of special interest, to the ends of a suspended magnetic needle, and so to the points of intensity of any magnet. By analogy it has finally been applied to the terminals of an electric cell, and it is hard at the present day to see in its application—whether to the battery or the dynamo—any likeness to the original sense of the word.

Many of our oldest terms have simply accompanied the ideas they express into engineering practice from architectural, nautical, smithy, and domestic uses. Examples are swivel, lathe, pump, gauge, list (from the same root as "lust"), fish-joint, brake, and most of the terms connected with masonry construction. Some of Latin origin are interesting, *e.g.* piston (pinsere=to pound, *cf.* "pestle"), camber (camerare=to enclose or vault), filter (filtrum=felt), and vice (vitis=the tendril of a vine). Some are derived from European languages—scarf (Scand. skarf=a joint), cam (Dut. kam), bush (Dut. bus=a box), ratchet (Eng. rack), calipper (Eng. calibre), and jetty, rabbet, tunnel, pulley, quoin, from the French. Others the derivations of which have never been traced are sprocket, cotter, journal (in the mechanical sense), and spline.

Of the methods employed to-day for christening new engineering conceptions, the favourite is the use of analogy. Probably more than a third of our expressions have been introduced in this way. In many the analogy is obvious—sleeper, bed, jacket, feed, booster (a U.S. colloquialism). Some are due to a likeness in appearance—crane, nose, shaft (from the arrow), groin (from its position), muff, worm; others to a similarity of function or movement—dead-beat, torpedo (the name of a fish), dog and jack (originally applied to any domestic implements of humble usefulness), pinion (from the joint of a bird's wing), valve (from anatomy), and siren (originally "one of certain sea-nymphs, who . . . sang with bewitching sweetness," dictionary!). In one or two the analogy is more subtle. Thus a "washer" is really a kind of lubricant, and so was considered to resemble the film of water between the hands in washing. "Bogie" is said to be from "bogey," a fiend, the bogie coal-waggon being so called because, from its suddenly turning when people least expected it, they used to exclaim that the new waggon was "Old Bogey" himself. "Steelyard," according to many dictionaries, owes its origin to the yard in London where steel was sold by German merchants, and where this kind of balance was in use.

Somewhat akin to this class are the one or two compound words we have formed—flywheel, manhole, breakwater, ingot (an ancient example, from "in" and Anglo-Saxon "géotan," to pour)—and words coined with the aid of suffixes, such as spin-dle (very old), tire (tie-r), troll-ey, tap-pet, span-ner.

Many technical terms have been formed directly from Latin and Greek words. There are old examples—pawl, carpentry, canal, cylinder; one or two of more modern date, such as electricity, annular, hydraulic; and a host of recent ones, telegraph, telautograph, microphone, vulcanite, dynamo, electrotechnics, asbestos, torque, rheostat, &c.

In general, it would seem that the terms used in construction work and machinery have been introduced mostly by the use of analogy, while the pioneers of industries—such as electrical engineering—more closely related to pure science, whose work has often been carried on in the university laboratory, have favoured the classical method in coining words.

Eight words used by electrical engineers form a class by themselves in that, instead of slowly making their way from some individual's suggestion to general recognition, they have been established by a parliament of scientific men, and have found an immediate and universal adoption. These are the electrical units. The original two—ohm and volt—were suggested by Sir C. Bright and Mr. Latimer Clark. These, together with ampere, coulomb, and farad, were made legal at the International Congress in 1881, and three fresh ones, joule, watt, and henry, were authorised by the Chamber of Delegates at the Chicago Exhibition in 1893. One striking feature of each of these words is its terseness, a virtue so often lacking to scientific expressions.

Proper names have been introduced in other ways as well. The most famous example is "macadam." Others are tramway (Outram's ways—from the inventor), galvanic, voltaic (in use before the unit was suggested), magnet, catalan (from Catalonia, the home of the catalan forge), derrick (the name of a hangman of the seventeenth century), and, a queer hybrid sometimes seen in print, marconigram.

A few words have been abstracted from foreign languages. Such are quay (an old example), voussoir, turbine, barrage, tuyere (also spelt, according to the dictionaries, twyer, tweer, tuyer, and twier), automobile, and chassis.

About the only scientific term (outside the advertisement columns) that can properly be called an invention is the word "gas." This we owe to a Dutch chemist, van Helmont, of the sixteenth and seventeenth centuries. His explanation is that, "because the water which is brought into a vapour by cold is of another condition than a vapour raised by heat; therefore . . . for want of a better name, I have called that vapour Gas, being not far severed from the Chaos of the Auntients." The word "clack," formerly applied to the non-return valve, is an echoic formation, but it was not coined to describe the valve, its first use being to express the sound produced by such mechanical appliances. It seems a little strange that the engineer, whose work is so often associated with original invention, should so seldom resort to original methods in devising names for his productions.

There are still many cases of inventions that have come into general use which are badly in want of a short, expressive title. Thus we have nothing better to describe the practice of signalling between mutually invisible points through the medium of the æther than "wireless telegraphy"; the only name available for the class of prime mover which works by the explosion of a vapour is "internal combustion motor"; and surely a handy substitute would be welcomed for "electric power supply," and some

more appropriate title for its particular vital organ than "central station." "Ferro-concrete" is certainly an improvement on "reinforced concrete," but it is a clumsy name for a material which does such important work in civil engineering. A similar case which existed until lately was the need of a substitute for "aërial navigation," but this has been most happily met by the suggested "aviation," a word which is both short in spelling and wieldy in pronunciation.

It is to be hoped that those who have to coin new engineering terms in future will follow the example of the old Dutch chemist and depart as little as possible from three-letter monosyllables. The times are growing too busy for more of the three- and four-syllabled obstructions of physicists and electricians to be tolerated.

A. H. DOWNES-SHAW.

SPORT IN CEYLON.[1]

FIFTEEN years' experience of the jungle, even though it be limited to one or two annual hunting trips, ought to suffice to make any keen sportsman (like the author of the volume before us) thoroughly familiar with the habits of all the larger forms of wild animal life to be met with in a circumscribed area somewhat smaller than that of Ireland. Mr. Storey has, however, not been content with his own great practical knowledge of the denizens of the Ceylon jungle and their ways, but has enlisted the aid of a number of his fellow-sportsmen. With such an array of specialists, the book may be regarded as a thoroughly up-to-date account of the sport to be met with at the present day in one of the most lovely of the islands of the East.

FIG. 1.—Head of Ceylon Buffalo. From Storey's "Hunting and Shooting in Ceylon."

[1] "Hunting and Shooting in Ceylon." By H. Storey (and others). Pp. xxiii+365; illustrated. (London: Longmans, Green and Co., 1907. Price 15s. net.

Unfortunately, this sport is nothing like what it was when Sir Samuel Baker shot and hunted in the island some sixty years ago, and if matters are permitted to go on as they are, it is the author's opinion that several of the game animals will be in danger of extermination, or at all events will be so reduced in numbers that Ceylon will cease to be a hunting-field for European sportsmen. The two species most sorely harried appear to be the chital, or spotted deer (Fig. 2), and the elephant. As both probably represent races peculiar to the island, their extermination would be little short of a calamity.

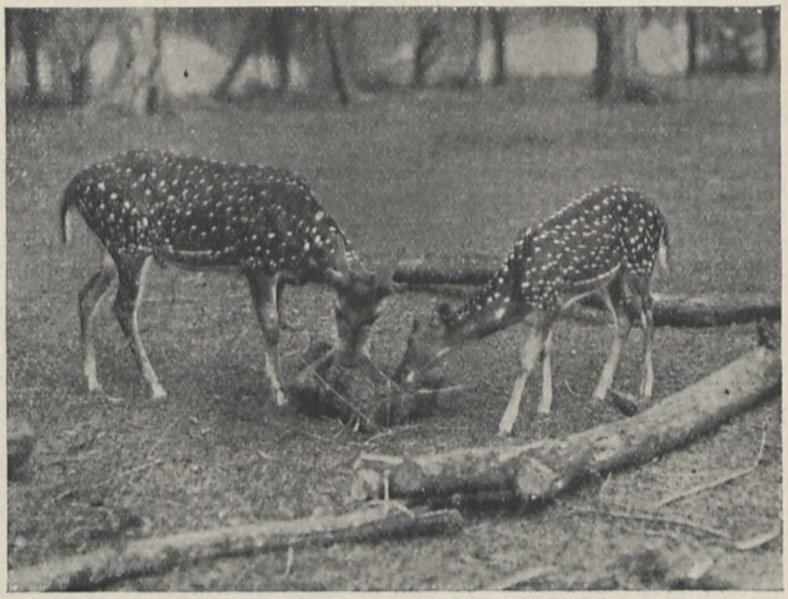


FIG. 2.—Chital or Spotted Deer; the buck with the antlers in velvet. From Storey's "Hunting and Shooting in Ceylon."

In the case of the chital (and this also applies in a minor degree to the sambar deer) the mischief seems to be due to the killing of this beautiful animal by native hunters for the sake of its flesh, which is cured and dried. The remedy suggested by Mr. Storey is the prohibition of all trade in products of the chase within the island itself, the villagers being, however, permitted to kill such deer as they require for themselves. As regards elephants, of which the author believes there are less than two thousand in the wild state in the island, the destruction appears to be mainly due to the European sportsmen, whose exertions were formerly stimulated by a Government reward for every one of these noble animals slain.

As Ceylon elephants generally have no tusks to speak of, it is a little difficult to see why sportsmen are so keen on shooting them, and it is to be hoped that the destruction may be stopped in the near future. Wild tuskers (not improbably belonging to a race originally imported from the mainland) are now, Mr. Storey tells us, very scarce in the island, although, except in the case of "rogues," they are rigorously protected. Naturalists will be much interested in a giant race of (practically) tuskless elephants living in the Tamankaduwa district which are much larger than the ordinary Ceylon form, and commonly attain a height of between 9 feet and 10 feet.

The author's observations with regard to the wild buffalo of the northern districts of the island, and

the figures of the head he gives (one of which is here reproduced), are likewise of very great interest to naturalists, for they seem to indicate that the Ceylonese animal is a distinct local race of *Bos bubalis*. After stating that the horns are smaller and less regular in form than those of the buffalo of the Indian mainland, Mr. Storey observes that

"In India they seem almost all to curve boldly outward and upwards, finally curving in towards each other at the points. In Ceylon they are very irregular, and usually much shorter, though occasionally they may be more massive than Indian horns. The commonest form are those curving outwards and upwards [in] crescent form, but not with the bold, almost half-circular, sweep of the Indian heads."

In this place it may be mentioned that as the author is not a photographer, he has been compelled to borrow the admirable photographs of scenery and animals with which the volume is illustrated from friends and brother-sportsmen. To one of these we have already alluded; a second, showing the most beautiful of all Ceylonese animals, is reproduced as an example of the general excellence of the pictures.

Like all the big-game animals of the island, the chital is specifically the same as its Indian representative. The very fact that tigers are unknown in the island is, however, itself practically sufficient to indicate that all these animals are racially distinct from the mainland forms.

Although big-game animals naturally form the main theme, the author has something to say regarding smaller game, and likewise gives much information with regard to the physical characters and scenery of the country; while the requirements of novices contemplating a sporting trip are not forgotten. Although confessedly written from the point of view of the sportsman rather than naturalist, Mr. Storey's volume contains much which appeals to both classes, while it may likewise be commended as a delightful description of a tropical country to the general reader.

THE DEATH OF M. M. BERTHELOT.

THE tragic death of M. Marcellin Berthelot on Monday has awakened a feeling of sympathetic sorrow throughout the intellectual world. As a chemist, philosopher, a fearless exponent of scientific truth, and permanent secretary of the Paris Academy of Sciences, M. Berthelot's work and influence made him renowned among the greatest men of our time. The French nation has to mourn the loss of one of its leading citizens, and its sorrow is shared wherever knowledge and research are cherished.

Several conflicting accounts of the dramatic circumstances of M. Berthelot's death appeared in Tuesday's papers. One report states that he expired clasping the hand of his wife, who had been ill for a year and had crossed the dark river a few minutes before. According to another account, M. Berthelot was sitting in his study when the news of his wife's death was brought to him by a nurse, and he fell back in his chair dead. The *Times* correspondent states that when M. Berthelot entered his wife's room on Monday he found her dead, and the shock was so great that he returned to his study and there died suddenly himself.

France knows how to honour its illustrious men, so it is not surprising to learn that at the opening of Tuesday's sitting the French Government proposed to grant a credit of 800*l*. for a national funeral for M. Berthelot, and to adjourn the sitting as a sign of mourning. A similar expression of sympathy took place in the Senate, and the Academy of Medicine likewise adjourned its sitting. We learn from the *Times* that there will be no religious service in honour of the dead. The national civil funeral has been accepted by the family on the understanding that Mme. Berthelot should not be separated from her husband, who could not live after her.

We propose to give an account of M. Berthelot's life and work in another issue, and here limit ourselves to the expression of deep regret at his sad death, and of satisfaction that the French nation has so clearly shown its high regard for the great man it has just lost.

NOTES.

THE Goldsmiths' Company has made a donation of 10,000*l*. to the Lawes Agricultural Trust (Rothamsted Experimental Station) to be devoted to research in connection with the soil, and to be known as the Goldsmiths' Company's fund for soil investigation.

MR. A. LAURENCE ROTCH, the founder and director of Blue Hill Meteorological Observatory, has been appointed professor of meteorology in Harvard University. The Blue Hill observations and investigations have been published for many years in the Annals of the Harvard College Observatory.

AT the annual general meeting of the Chemical Society on Friday, March 22, the president, Prof. R. Meldola, F.R.S., will deliver an address entitled "The Position and Prospects of Chemical Research in Great Britain."

MR. W. H. POWER, C.B., F.R.S., medical inspector of the Local Government Board, has been appointed chairman of the Royal Commission on Tuberculosis, in succession to the late Sir Michael Foster.

THE *Times* correspondent at Ottawa reports that on Tuesday a deputation of representative Canadians asked for a Federal grant towards the erection of a national memorial at Brantford, Ontario, in honour of Dr. Alexander Graham Bell, who invented the telephone in that city. In reply, Sir Wilfrid Laurier expressed himself in hearty sympathy with the movement.

A MINISTERIAL measure having for its object the amendment of the Patent Law was introduced in the House of Commons on Tuesday. The main purpose of the Bill is to prevent the patent laws from being used for the hindrance and suppression of British industrial development. It is proposed to simplify the procedure of compulsory licence, and instead of the applicant having to go before the Judicial Committee of the Privy Council, as at present, he will go, first of all, before the Controller and afterwards before a judge specially selected by the Lord Chancellor, who will be habitually dealing with patent cases. This method will tend very considerably to shorten the hearing of cases, because they will be dealt with by an expert judge. The Bill also provides that any applicant can go to the Controller three years after the granting of any patent and apply for the revocation of the patent on the ground that it has not been adequately worked within the United Kingdom. In addition to compulsory working, syndicates are to be enforced to deposit samples when the Patent Office requires them to do so, or else their application will be refused.

THE Geologists' Association has arranged an excursion to Plymouth from Thursday, March 28, to Tuesday,

April 2, so that members who can spend Easter in the west will be able to study the rocks and deposits of the Plymouth and Cornish areas under very pleasant conditions. The excursion secretary is Mr. G. E. Dibley, 7 Champion Crescent, Lower Sydenham, S.E.

EARL CARRINGTON, President of the Board of Agriculture, has accepted the invitation to open the second National Poultry Conference at Reading on Monday evening, July 8. The Mayor of Reading (Mr. E. Jackson) has intimated his intention to give a reception to delegates and members in the Town Hall, Reading, on that evening, when the official opening of the conference will take place.

A PRELIMINARY announcement has been issued regarding the arrangements for the fourth International Mathematical Congress, which is to be held in Rome on April 6–11, 1908. A large general committee has been formed representing the Reale Accademia dei Lincei and the Circolo matematico di Palermo. A special feature will be the organisation of lectures, or, to use the American term, colloquia, each embracing the survey of an extended region of mathematical science, and the following mathematicians have promised to lecture:—Profs. G. Darboux, A. R. Forsyth, D. Hilbert, F. Klein, H. A. Lorentz, G. Mittag Leffler, S. Newcomb, E. Picard, H. Poincaré. The subscription is 25 francs for members, 15 francs for ladies' tickets. The treasurer is Prof. Vincenzo Reina, 5 Piazza S. Pietro in Vincoli, Rome, while Prof. G. Castelnuovo, at the same address, is general secretary of the organising committee.

THE sixtieth annual meeting of the Palæontographical Society was held at the apartments of the Geological Society, Burlington House, on March 15. The report of the council referred to the activity of students of palæontology in Great Britain at the present time, as witnessed by the number and variety of the memoirs offered for publication. Among instalments of monographs issued in 1906, one completed Mr. Reed's description of the Girvan Trilobites and another began a new monograph of Cambrian Trilobites by Mr. Lake. The Carnegie trust for the universities of Scotland had defrayed the cost of five plates of Old Red Sandstone fishes described by Dr. Traquair. The society lost several subscribers by death in 1906, among these the Rev. J. F. Blake, who left his monograph of Cornbrash fossils unfinished. The funds had been augmented by a special sale of back stock to members, but many new subscribers were needed to raise the normal income to the amount received by the society ten years ago. Dr. Henry Woodward, F.R.S., Dr. G. J. Hinde, F.R.S., and Dr. A. Smith Woodward, F.R.S., were re-elected president, treasurer, and secretary respectively. Messrs. J. Hopkinson, W. D. Lang, H. Woods, and G. W. Young were elected new members of council.

THE Pharmaceutical Society of Great Britain has on several occasions benefited by the generosity of Sir Thomas Hanbury, whose death was announced in last week's NATURE. To the museum of the society he presented the valuable collection of rare ancient and modern materia medica made during many years by his brother Daniel, as well as the whole of the medicinal plants of his rich herbarium. These now occupy a special room of the museum, named the Hanbury Room. To the library of the society he presented a fine collection of scarce and valuable works on materia medica and botany, many of which are now extremely difficult to obtain. At the re-opening of the School of Pharmacy in 1903, at which he was present, Sir Thomas expressed the wish that his name should, in future, be associated with the Daniel Hanbury gold medal, which is offered biennially by the Pharmaceutical Society for original research in the natural history and chemistry of drugs, and he handed to the society securities, so that each recipient of the gold medal should at the same time be presented with the sum of fifty pounds. His generosity extended even to the School of Pharmacy, the silver medallists of each session receiving copies of "Pharmacographia" and "Science Papers," in which volumes the life-work of the late Daniel Hanbury are embodied. It is interesting to note that the munificence of Sir Thomas always had a practical aspect. His gifts were intended to help and stimulate personal effort, and were always given with discrimination after due consideration.

A SCIENTIFIC expedition under the auspices of the Royal Geographical Society, the funds for which had been found by the Alpine Club, had been arranged to explore Mount Everest from the Tibetan side. It was proposed that the party, under the command of Major the Hon. Charles Bruce, M.V.O., of the 5th Gurkha Rifles, should travel from Darjeeling north to Kampadzong, just on the Tibetan side of the Indian frontier. There it would have turned sharply and nearly due west to Kharta, from near which point the ascent was to have been commenced. Nepaul territory would nowhere have been violated. It was proposed, moreover, that the natives should have been dealt with directly by the English leaders, and that every precaution should be taken to avoid any cause of friction. The Home Government, however, refused the necessary permission. Mr. Morley, replying to a letter from Sir George Goldie, K.C.M.G., president of the Royal Geographical Society, said it was not possible, consistently with the interests of the policy of the Government, for the Government of India to give encouragement or help to exploration in Tibet. Mr. Morley later in his letter made the unfortunate assumption that it was proposed to proceed "furtively" through Tibetan territory, a suggestion which Sir George Goldie repudiates very emphatically. It is conceivable that high Imperial policy should lead the Government to decide that the expedition was inexpedient, but it is difficult indeed to realise that Mr. Morley should have supposed that a body of distinguished geographers could countenance for an instant any scheme of a "furtive" character.

THE annual dinner of the Institution of Civil Engineers was held on March 13, when the president, Sir Alexander Kennedy, F.R.S., was in the chair. Lord Kelvin responded to the toast "Science and Literature," and is reported by the *Times* to have said it is interesting to remember that science has touched some of the noblest departments of art, for Leonardo da Vinci was one of the greatest engineers as well as one of the greatest artists of all times. Lord Kelvin also referred to the great achievements of Smeaton, the engineer of the Eddystone Lighthouse, and remarked that scientific engineering has grown up since the middle of the nineteenth century. About 1838 or 1839 the first professor of engineering in the British Empire was appointed, his chair being one established in the University of Glasgow. The demand of engineers for improved training in science has never flagged since then, and all our universities now have engineering schools. Lord Tweedmouth, in responding to the toast of "The Guests," remarked that the engineering profession

is very close indeed to the heart of the Admiralty. He referred to the services of Sir Alexander Kennedy in connection with naval construction, to the advice concerning dockyards given by Sir William Matthews, and to the distinguished work as a designer of ships of Sir William White. It is comparatively recently, he said, that the Admiralty has been so closely brought in touch with the civil engineer. But all the great works ordered by the Admiralty have been carried out by the advice of engineers.

AN unsettled type of weather prevailed over the whole of the British Islands during the past week, and the wind frequently attained the force of a gale on our coasts. A storm of more than ordinary severity was experienced in the north-west of England during the late hours of Saturday and the early hours of Sunday (March 16–17). In places on our north-west coast the wind attained the pressure of about 18 lb. on the square foot. The storm reached its greatest violence from about 9 p.m. to midnight, and afterwards the gale rapidly subsided. Unfortunately, the strongest wind force was coincident with the occurrence of high water, and in consequence much damage was occasioned by wind and wave. Notwithstanding the windy character of the weather, thick fog has prevailed on our south-west coasts, resulting in the grounding of at least two large steamships—one going ashore late on Sunday night and the other in the early morning on Monday.

THE report of the Maidstone Museum, Public Library, and Art Gallery, for 1906, chronicles a very successful year, notably for the fact that presentations have been made by donors living at considerable distances from the borough. Misprints like Malay Peninsular and Osteolepus somewhat detract from the style of the report.

THE blue jay (*Cyanocitta cristata*), the killdeer plover (*Ægialitis vocifera*), and the bluebird (*Sialia sialis*), form the subject of the last three of the excellent series of illustrated leaflets issued by the (U.S.) National Association of Audubon Societies.

NEW or little-known perch-like fishes in the collection of the academy, and the land-shells of the Ozark Mountains of Arkansas and Missouri, form the subjects of papers in the issue of the Proceedings of the Academy of Natural Sciences of Philadelphia for December last.

AT the conclusion of an exhaustive memoir on the development of the common ring-snake (or grass-snake), published in vol. lxxxvi., part i., of the *Zeitschrift für wissenschaftliche Zoologie*, the author, Mr. Theodor Viefhaus, institutes a careful comparison to show in what respects the early stages of a number of other reptiles differ from those of the species described. The preamnion and the primitive groove are among the structures in which such differences are in many cases very notable.

THE report of the Royal Scottish Museum, Edinburgh, for 1906, contains a well-merited tribute to the services of Dr. R. H. Traquair, who retired in August last after a thirty-two-years' tenure of the post of keeper of the natural history department. Among the gifts received during the year, mention may be made of a giraffe from the Quasaengeshu plateau, British East Africa, presented by Lord Hindlip. This should be of the same race as the large mounted pair exhibited in the Natural History Museum.

To the *Naturalist* for March, Mr. Arthur Whitaker contributes further notes on the breeding habits of British bats, and more especially the ordinary bat, or pipistrelle. July, it appears, is the great month for breeding among British bats, and it has been demonstrated that in the pipistrelle the period of gestation is not less than forty-one days, and is probably of about six weeks' duration. At birth the young pipistrelle is flesh-coloured, totally blind, and naked except for a few hairs on the muzzle. Fur begins to show in about a week, and soon after imparts a golden tinge to the back and a more silvery tint to the under-parts. Even when only a few days old the young bats might be seen hanging altogether apart from their parents, but up to the thirty-first day (when the last died) they did not attempt flight on their own account.

INSECTS associated with or related to the Mexican cotton-boll weevil continue to engage the attention of the U.S. Bureau of Entomology, parts iii., iv., v., and vii. of Bulletin No. 63 being devoted to them. The most important of these is the Texan ant, *Solenopsis geminata xylone*, which attacks the boll-weevil in sufficient force to effect an appreciable diminution in its numbers. An examination made last autumn of 300 fallen squares and bolls of cotton collected indiscriminately showed that 40 per cent. of the weevils (in all stages) by which they were infested had been killed by the ants. The ant, which is widely distributed in Texas and western Louisiana, and may be found on totally different types of soil, is undoubtedly of considerable benefit as an established enemy of the weevil throughout nearly all the area at present infested by the latter.

A SUGGESTION for obtaining colour-correct photographs of flowers and natural objects without the use of colour screens is made by Mr. J. H. Crabtree in the current number of the *Photographic Monthly*. The method consists in using flashlight powders containing lithium and strontium compounds. It should be instructive to compare results obtained by photographing parrot-tulips in this way with photographs taken with a carefully selected colour screen.

IT is at first somewhat surprising to note the great variety of fruits recommended for cultivation in Ceylon in a Circular (vol. iii., No. 14) issued from the Royal Botanic Gardens, as the lists include such European fruits as the pear, cherry, and blackberry, as well as tropical and sub-tropical productions. This is possible owing to the variations in climate at different elevations, and the author, Mr. H. F. Macmillan, arranges his lists according to a vertical scale. A second year's experimental trial of cotton cultivation at Maha-iluppalama forms the subject of another Circular (No. 18).

IN the Kew Bulletin (No. 2) is published the nineteenth series of "Diagnoses Africanæ," containing new species of Hibiscus, Adenium, Strophanthus, and a new Landolphia from Delagoa Bay; also the twelfth series of "Decades Kewenses," including an Aconite from Sikkim and two species of Vitex from Borneo. A collection of marine algæ from the Chatham Islands, from which two new species were obtained, is described by Mr. A. D. Cotton, and Mr. J. M. Hillier contributes some notes on economic products imported into Liverpool. The possibility of growing *Catalpa cordifolia*, allied to the ornamental *Catalpa bignonioides*, for timber in this country is answered in the negative by Mr. W. J. Bean.

THERE is a chance of unintentional misrepresentation or exaggeration when reports of scientific discoveries are presented by non-scientific writers, a notable instance having recently occurred in certain accounts of plant experiments made by Mr. L. Burbank. In these circumstances, an authentic account by a competent critic was desirable, and such is found in the article contributed by Prof. Hugo de Vries in the *Century Magazine* for this month. While it has happened that owing to the neglect of European records, horticultural productions have been incorrectly described as new in America, there is no doubt as to the novelty of many interesting sports collected and developed by Mr. Burbank; the Bartlett plum, thornless brambles, and the scarlet Californian poppy attracted Prof. de Vries's notice as he was on the look-out for possible mutations. But in so far as statements have been made that the practical results are opposed to scientific theories, such as the laws of Mendel, Prof. de Vries concludes that Mr. Burbank has not studied these theories, being chiefly concerned with the practical value of his varieties.

MR. W. E. COLLINGE, head of the department of economic zoology of the University of Birmingham, sends us particulars of a new gooseberry pest identified by him as a result of recent work upon the genus of mites known as Eriophyes, of which *E. ribis* (Nalepa), causing "big bud" on black currants, is perhaps the most familiar example. Mr. Collinge has long held the opinion that many other fruit trees would ultimately be found to possess these mites. During the past week he has found a mite of the genus Eriophyes in a number of gooseberry cuttings received from Evesham. The species, which appears to be a new one, is rather longer than *E. ribis*, and a full description of it will be published. It is proposed to name the mite *Eriophyes grossulariae*. The purpose of the present communication is to direct the attention of all gooseberry growers to the new wood of their trees, upon which the buds appear to be dead or drying up. Such should be cut off and immediately destroyed by burning.

THE Phillips Academy, Andover, Mass., which claims to be "the only preparatory school in the world that possesses a fine museum and department of archæology," has issued two Bulletins prepared by Mr. W. R. Moorfield, the curator of the Peabody Museum in connection with that institution. The greater part of the first is devoted to an account of the exploration of the Chaco group of Pueblos in New Mexico, from which many specimens of a familiar type were disinterred. More novel and interesting is the description of Flint Ridge, which in the opinion of the author "furnished more material for aboriginal usages than did any given area in the United States. Arrows and knives made of its multicolored chalcedony and chert are found in western New York and far down the Mississippi." The second Bulletin is a study of the "so-called gorgets," a class of perforated articles made of slate, so named because they are generally supposed to be neck ornaments. Various uses have been suggested for these curious objects—that they were ornaments or decorations without religious significance; that they were used as beads, buckles, or buttons; as weights or spindle-whorls; for games; or, finally, as amulets. The authors, after a review of these various suggestions, conclude that they were used as neck ornaments with some religious significance, as "bracers," or wrist-protectors in using the bow, and for twine-twisting or netting: but the subject is far from being exhausted, and their origin and use are still obscure. On the whole, these pamphlets are a welcome indication of the importance of anthropological studies in the United States.

THE Transactions of the Institution of Engineers and Shipbuilders in Scotland (vol. l., part iv.) contains a paper by Mr. J. G. Johnstone on the stability of submarines. Accidents have happened to several navigable submarine vessels, and as these vessels were of the type known as the diving submarine, there has been much discussion regarding the stability of vessels of that special type. The author gives results of investigations into the static stability and the stability of motion of a special case. As the speed of future types is to be made greater, the more important becomes the necessity for such investigations, and it is urged by the author that tank experiments would be of special value.

THE coal-dust problem is discussed by Mr. James Ashworth in *Engineering* of March 15. Dust of any sort is a source of danger in every mine that produces firedamp. The records of various explosions show that the only certain arrestment of a coal-dust explosion occurs when there is an excess of dust, which smothers the flame through lack of air to maintain combustion, and that the most favourable atmosphere to encourage the spread of an explosion is that which contains a maximum percentage of water vapour and a normal quantity of floating coal-dust. Protection against disaster is therefore limited to safe lighting and safe blasting. The watering of dusty roads, which is compulsory in Westphalia, is no deterrent to wholesale devastation.

IN the Journal of the Franklin Institute (vol. clxiii., No. 2) there is an exhaustive article by Mr. E. S. Sperry on the manufacture of rolled sterling-silver. Within the past twenty-five years this manufacture has undergone a remarkable change. Instead of being confined to the wealthy, sterling-silver is now found in very general use, the reason being, not the reduction in the price of silver, but in the cost of manufacture due to the use of rolled sheet-metal. Articles which formerly were made from rods are now made by stamping from sheet-metal, with the employment of modern machinery in place of hand labour. The various operations employed in the production of the sheet-metal which is the foundation of the manufacture of modern sterling-silver ware are described and illustrated by Mr. Sperry.

THE *Geographical Journal* for March contains a valuable discussion of the existing observations of the heights of the central African lakes and mountains, by Captain T. T. Behrens, R.E. The surfaces of the three principal African lakes having been connected with each other and with the Indian Ocean by a complete set of trigonometrical operations, Captain Behrens compares the results with earlier determinations by hypsometer and barometer, and he also deals with the heights of the principal peaks, which have been connected trigonometrically with more or less accuracy. A list of heights, based on mean sea-level at Mombasa, and carried to Lake Victoria by Uganda railway levels, is compared with means from travellers' observations, and also with values obtained by Dr. Kohlschütter, who employs a modification of the usual formulæ which allows for the influence of local climatic factors. The results seem to indicate that the barometric and hypsometric observations give closer approximations to the truth than is generally supposed.

IN NATURE of February 8, 1906 (vol. lxxiii., p. 352), a brief account was given of the proceedings of the meeting of the International Meteorological Committee in Innsbruck in September, 1905. The k.k. Zentralanstalt für Meteorologie und Geodynamik has now published a volume of 154 pages (Vienna: W. Braumüller, 1906) which contains a full report of these proceedings and much other valuable information. Thus, in addition to the reports of several special committees which dealt with cloud classification, earth magnetism, and atmospheric electricity, a valuable series of appendices is given consisting of communications to the commission relating to many different subjects of interest and importance which were considered. The text of this volume is in the German language, but a resolution of the commission was passed at the fourth meeting to the effect that both English and French editions should be subsequently published.

SINCE the discovery and practical application in Germany of processes for producing "synthetical" indigo, the planters of India have made strenuous efforts to improve their methods of dealing with the natural material. In this connection, the report for the year 1906–7 of the work of the Indigo Research Station, Sirsiah, of the Bihar Planters' Association, which has just been issued, presents interesting reading. The report, written by Mr. Cyril Bergtheil, is divided into three sections, namely, laboratory work, manufacture, and agriculture. Perhaps the principal point that merits notice is that relating to the discrepancies between the results obtained by a number of different analysts who were entrusted with the examination of the same samples of indigo. The same material was analysed at Calcutta, Bradford, Manchester, and Berlin, and results were returned by the different analysts varying from 71 per cent. to 96 per cent. of indigotin. The question of the analysis of indigo has recently been the subject of several papers, but it is by no means yet decided which is the best and most trustworthy method for the purpose, although Mr. Bergtheil confidently recommends the processes he has adopted. The question of analysis is one of great importance, and it is clear that no real progress in indigo research can be made until it is satisfactorily settled. What appears to be a decided improvement in indigo culture is described in the report with reference to the germination of the seed of the Java plant. It would appear that this seed does not usually germinate satisfactorily owing to its possessing a "cuticle" which is impermeable to water. To remedy this, it has been found advantageous to soak the seeds for half an hour in concentrated sulphuric acid, and subsequently to wash with water very thoroughly before sowing. Good seed treated in this way has been found to germinate to the extent of 100 per cent. The report also deals in detail with the work done on the farms established recently to supply seeds of the Java indigo plant.

UNDER the title "A Junior Course of Comparative Geography" Messrs. G. Philip and Son, Ltd., have just issued Course A of the "Progressive Course of Comparative Geography," reviewed in the supplement to NATURE of March 14 (p. v). The price is 2*s*. 6*d*. net. The same publishers have sent us a copy of the seventh edition, revised to date, of their "Handy-volume Atlas of the World," by Mr. E. G. Ravenstein. The price of this compact little volume is 3*s*. 6*d*.

IT is clear from the thirty-seventh annual report of the Natural Science Society at Wellington College that the society is in a flourishing condition. There is a balance in hand of 113*l*., for which, it is to be hoped, some useful scientific purpose will be found. The Saturday scientific lectures, which have become a feature of the work of the society, were continued during the Michaelmas and Lent terms. The meteorological report of the society is as complete as usual.

THE most recently published parts of the Transactions of the Royal Society of Edinburgh are vol. xli., part iii., for the session 1904–5, and vol. xlv., part i., for the session 1905–6. The papers included in these publications cover those read before the society during a period of about eighteen months. The contents are very varied, and amongst subjects of special interest in the first-named part may be mentioned the fresh-water plankton of the Scottish lochs, the structure of the series of line- and band-spectra, the hydrodynamical theory of seiches, and the plant remains in the Scottish peat mosses. In the second of the publications are, with others, papers on the varying form of the stomach in man and the anthropoid ape, the normal temperature of the monkey and its diurnal variation, and on the effect of changes in the daily routine on this variation, the elevation of the boiling points of aqueous solutions of electrolytes, and the relationship between concentration and electrolytic conductivity in concentrated aqueous solutions.

THE report for 1906 of the Agricultural Research Association for the north-eastern counties of Scotland is devoted almost entirely to an account, by Mr. T. Jamieson, of work on the utilisation of nitrogen in air by plants, in continuation of the observations described in NATURE a year ago (vol. lxxiii., p. 531). Mr. Jamieson claims that he has obtained further evidence of the absorption of nitrogen from air by plants, but the views of scientific experts upon the doctrine he desires to establish were stated in the notice of the previous volume. We have not the space available to enter into a detailed statement of Mr. Jamieson's position and point out the unsound foundation upon which it rests. We must therefore refer our readers to the volume just published for particulars of experiments which Mr. Jamieson puts forward as material for a new agricultural science. The criticisms of his views expressed at the York meeting of the British Association last year, and also in other places, are dealt with at the end of the present volume.

OUR ASTRONOMICAL COLUMN.

COMET 1907*a* (GIACOBINI).—The following elements and ephemeris have been computed for comet 1907*a* by Herr M. Ebell, from places observed on March 9, 10, and 11:—

Elements.

$T = 1907$ March $23{\cdot}5206$ Berlin.
$\omega = 319^\circ\ 34'{\cdot}3$
$\Omega = 97^\circ\ 40'{\cdot}0$ } 1907·0
$i = 141^\circ\ 20'{\cdot}5$
$\log q = 0{\cdot}\mathfrak{1}176$

Ephemeris 12h. (M.T. Berlin).

1907	α (h. m.)	δ (° ′)	Brightness
March 19	6 40	−9 26	0·81
23	6 33	−6 22	0·74
27	6 27	−3 34	0·67

Brightness at time of discovery (mag. 11·0) = 1·0.

From the above it will be seen that the comet is travelling through the constellation Monoceros towards the northern part of Orion, and that its brightness is decreasing fairly rapidly. At present it crosses our meridian at about 6.30 p.m., and sets at about 11.30 p.m.

In No. 10 (March 11) of the *Comptes rendus* M. Giacobini states that the comet is a round nebulous object of 20″ diameter, having an eleventh-magnitude nucleus, and, apparently, a tail in position-angle 180°.

SEARCH-EPHEMERIS FOR COMET 1900 III. (GIACOBINI).—In No. 4159 (March 7) of the *Astronomische Nachrichten* Herren Abold and Scharbe publish a search-ephemeris, extending from March 5 to April 2, for comet 1900 III. As the probable time of perihelion passage is very uncertain, they give three ephemerides, in which T is taken as May 5, June 8, and July 13 respectively, June 8 being considered the most probable. No perturbations have been taken into account, and as on March 13 the calculated brightness was but 0·4 of that observed on February 15, 1901, it is feared that the hopes of re-discovering this object are but small.

SOLAR OBSERVATIONS AT CATANIA.—In No. 2, vol. xxxvi., of the *Memorie della Società degli Spettroscopisti Italiani* Prof. Riccò publishes the summarised results of the solar observations made at the Catania Observatory during the third and fourth quarters of 1906. There was a marked decrease in the daily frequencies of spots, faculæ, and prominences during the fourth quarter as compared with the third, which, however, showed an increase in the daily frequency of all three phenomena on comparison with the results of the second quarter.

INTENSIFICATION OF "CONTRAST" BY MEANS OF A POLARISCOPE.—Some interesting suggestions concerning the intensification of contrast in astronomical observations, by the employment of the polariscope, are made by Dr. Felix Biske in No. 2, vol. xxxvi. (February), of the *Memorie della Società degli Spettroscopisti Italiani*.

Dr. Biske points out that under certain conditions of the atmosphere and positions of the body observed it is possible to polarise the light received so that the ratio of the amount of light from the body to that of the sky is increased, thus rendering the details of the observed object more easily visible. It is suggested that by this means the observation of the corona whilst the sun is not eclipsed may be facilitated, and that comets, the light from which often shows a fair amount of polarisation, may be observed more easily. Similarly the planets Mercury and Venus and the moon may, under certain conditions, be observed when by the ordinary method this would be very difficult or impossible.

THE MINOR PLANET (588) [1906 T.G.].—In No. 4155 of the *Astronomische Nachrichten*, Dr. Bidschof gives a new set of elements and an ephemeris for the minor planet (588), which, it will be remembered, is remarkable for its extraordinary aphelion distance, lying an astronomical unit beyond the mean distance of Jupiter. The elements are based upon observations made during 1906, and differ somewhat from those previously published by Dr. Berberich. This interesting object will be unfavourably situated for northern observers for several years, but it is to be hoped that the southern observatories will endeavour to keep it under observation.

The present magnitude of the planet is about 15·0, and it was re-observed by Prof. Wolf, in a position in fair accordance with Dr. Bidschof's ephemeris, on January 22.

RESEARCHES IN STELLAR PHOTOMETRY.—Under the title "Researches in Stellar Photometry during the Years 1894 to 1906," made chiefly at the Yerkes Observatory, the Carnegie Institution of Washington has published a beautifully prepared and illustrated volume containing the results of Mr. J. A. Parkhurst's careful and systematic study of twelve variable stars having long periods and faint minima. The observations were carried out first with a 6-inch reflector, then with a 12-inch refractor, and finally with the 40-inch refractor of the Yerkes Observatory. Argelander's method of comparison was employed, and during the later years the comparison stars were carefully standardised with a Pickering equalising wedge-photometer. In addition to the tabulated results giving the individual observations of the variable and of the comparison stars, Mr. Parkhurst gives the complete light-curve, for the period of observation, of each variable, and a plate reproduction of a photograph showing the region surrounding each star; the majority of these are on the scale of 1 mm. = 13″·5 (approx.). As an example of an attack on an important phase of the sidereal problem, the volume is almost unique in the wealth of detail it contains and the lavish manner in which the results are presented.

MARSUPIALS OR CREODONTS?

THE vexed question as to the real affinities of the marsupial-like carnivores of the Santa Cruz beds of Patagonia has once more been brought prominently to the front by the appearance of a memoir on their osteology and dentition in the fourth volume of the reports of the Princeton Expedition of 1896–9 to Patagonia. In this memoir the author, Mr. W. J. Sinclair, takes up a very decided position, remarking that these so-called sparassodonts (as represented by Prothylacinus, Borhyæna, Amphiproviverra, &c.) possess a number of characters either peculiar to marsupials or common to that group and only a few other orders. These, it is urged, will convince the reader that sparassodonts are true carnivorous marsupials, not worthy of even separate subordinal rank. Mr. Sinclair goes, however, even farther than this, and considers himself justified in including the Patagonian carnivores in the same family group as the existing Tasmanian pouched wolf or thylacine, which he separates from the Dasyuridæ under the designation of Thylacinidæ (or Thylacynidæ). It is added that, "although there is sufficient similarity in structure to warrant placing the Patagonian and Tasmanian thylacines in the same family, it must not be inferred that the existing genus is the direct descendant of its extinct South American forerunners. The study of the group has failed to show a closer relationship than probable descent from a common Santa Cruz ancestor. While retaining the fundamental family characters, both lines have diverged, and in some respects the Santa Cruz forms are more advanced than the existing genus."

Among the structural features on which the author relies as evidence of the marsupial nature of the Patagonian fossils are the dental formula, the reduction in the number of successional cheek-teeth, the inflection of the angle of the lower jaw, a number of peculiarities in the conformation of the skull, and the perforation of the transverse process of the seventh cervical vertebra by the arterial canal. On the other hand, vacuities in the bony palate and epipubic (marsupial) bones, both of which are characteristic of most existing marsupials, are wanting.

As regards the dental formula of the cheek-teeth, this, in the opinion of Dr. J. L. Wortman (*Amer. Journ. Sci.*, vol. xi., p. 336, 1901) and the present writer, is identical in the sparassodonts, carnivorous marsupials, and creodonts, and is, therefore, of no importance, except to indicate the mutual relationship of all these three groups. By all zoologists of the present day it is, I believe, admitted that the reduction of the replacing teeth in modern marsupials to a single pair of premolars in each jaw is a secondary feature, so that the presence of a larger number of such teeth in the sparassodonts indicates the more primitive nature of those mammals, and one allying them to creodonts. Some of these sparassodonts differ, however, from all the more typical representatives of the latter group in having four, in place of three, pairs of upper incisor teeth, and thus resemble carnivorous marsupials; but since this feature is likewise regarded by Dr. Wortman (*op. cit.*, p. 335) as of secondary origin, it is no bar to the derivation of sparassodonts from creodonts, while it indicates that the latter are not likely to be the descendants of the former. As the author himself regards the presence of vacuities in the palate and the inflection of the lower jaw as being likewise secondary features in marsupials, all these lines of evidence point to the conclusion that creodonts are the most primitive of the three groups under consideration.

It follows from this, on the author's assumption that the Patagonian carnivores are thylacines, that palatal vacuities have been independently developed in several families of existing marsupials, and a similar argument will hold good with regard to the reduction of the

successional cheek-teeth. Such independent developments seem, however, in the highest degree improbable.

The fact that in the existing thylacine the epipubic bones do not ossify may perhaps be held to indicate that a similar condition obtained in the Miocene sparassodonts, although such a loss is improbable in these early forms, more especially as one of them is considered to have been partially arboreal. Be this as it may, it is quite clear (unless we again admit a series of independent developments) that the sparassodonts cannot be regarded as belonging to a grade of marsupials in which these bones had not yet been evolved, because we find them fully developed in the Oligocene opossums.

The most important argument of all against the marsupial nature of these Patagonian carnivores is, however, one derived from the nature of the enamel of their teeth, which does not appear to have come under the author's notice. According to the observations of Mr. C. S. Tomes (Proc. Zool. Soc. London, 1906, p. 45) the enamel of the sparassodont teeth is histologically identical with that of creodonts and modern carnivores, and quite unlike that of all marsupials.

Seeing, then, that sparassodonts, which are later in age than certain undoubted marsupials, differ from existing carnivorous marsupials as a whole in the minute structure of their dental enamel, by the lack of epipubic bones, the absence of unossified spaces in the floor of the skull, and apparently by the larger number of successional premolars, it seems improbable that they are really members of that group. On the other hand, they resemble creodonts in their complete palates, in the absence of epipubic bones, and to a great degree as regards the replacement of the cheek-teeth, while it is highly probable that many of the cranial characters referred to as being marsupial may really be primitive ones. The one essentially marsupial feature is the presence, in some cases, of four pairs of upper incisors.

On the whole, therefore, it seems advisable to regard the Patagonian carnivores as creodonts showing a tendency (it may or may not be parallelism) towards the marsupial type. That creodonts, sparassodonts, and carnivorous marsupials are, however, related groups, and that the former are not improbably the oldest and most primitive of all known mammals (perhaps directly descended in "Gondwanaland" from anomodont reptiles), appears almost certain. And it may further be suggested that these early creodonts have developed in one direction towards the sparassodont type, in a second towards the carnivorous marsupials, while in a third line they have developed into the modern Carnivora. Beyond this it seems at present impossible to go.

It should be added that the present writer was at one time of opinion that sparassodonts were marsupials.

R. L.

THE GODS OF HEALING OF THE EGYPTIANS AND GREEKS.

DR. R. CATON recently delivered a short course of lectures on the above subject in connection with the Institute of Archæology at the University of Liverpool. After referring to the works on medicine written by Athosis, the son of Menes, and also by the Pharaohs, Usaphais and Semti in very early times, he described briefly the cults of Isis, Serapis, Thoth, and I-em-hotep, and gave a short account of the temples in which the work of healing took place. Of these, quite the most important was the temple of I-em-hotep at Memphis. All these shrines of healing are destroyed, excepting the small temple of I-em-hotep on the island of Philæ. Dr. Caton referred to the large number of medicinal agents used by the Egyptians, and to the practice of incubation or temple sleep. In the temples of Isis and Serapis, and probably in the more important shrines of I-em-hotep, the sick slept in or adjacent to the temples, in the belief that the god would manifest himself to them or speak to them in dream or vision, and suggest the method of cure. Such dreams or visions were interpreted by the priest, and the treatment adopted was supposed to be founded in accordance with them. Sometimes no dream was vouchsafed, or no interpretation could be drawn from it bearing on the disease; in that case the priest did the dreaming. The priests of I-em-hotep had also to do with the embalming of the body, and, partly through this, they acquired a considerable knowledge of anatomy, and learned certain facts regarding the circulation of the blood. Some of the medical papyri contain remarkable details as to the blood-vessels and the movement of the blood; probably the Greeks obtained from them all the knowledge they possessed on this subject.

In Greece and Magna Græcia various gods and demigods were supposed to possess medical powers. Men Karon at Laodicea was a health god much in vogue in Asia Minor, and a large medical school was associated with his temple.

Apollo, Amynos, Asklepios, Hygeia, Amphiaraus, Trophonios, Aphrodite, and the Chthonic deities Pluto, Demeter, Persephone, and others of lesser importance were eminent for their health-giving efficacy in Greece. Of these, the cult of Asklepios was by far the most important. At numerous splendid temples, rich with the finest products of Greek art, the worship of the god and the cure of the sick were carried on for centuries.

Epidaurus was perhaps the most important of these shrines; it was a centre from which the cult was disseminated through other parts of Greece and the colonies. Trained priests, and also the sacred serpents, which were believed to be the incarnation of the god, were sent thence to carry on the work of healing in such places as Athens, Corinth, Delphi, Pergamon, Cnidos, Rhodes, Cos, and many other cities.

In all, incubation was the initial step and the guide as to treatment. Probably the people would have had no confidence in the methods used but for the belief that the god himself had suggested them; even the priests themselves may in part have been believers. Many of the priests were physicians, who in the course of ages compiled much valuable information; they possessed useful methods of treatment in regard to rest, to diet, to the remedial use of exercise and of baths, and medicines. The ritual was beautiful and impressive, and their practice seems to have been humane in all respects except one. The god and his priests must have no dealings with death or with birth. If either were impending, the unhappy patient was at once expelled from the holy precinct. Not until the time of the Antonines were the special "houses of Birth and of Death" provided, external to the precinct for these two classes of sufferers.

At Cos the influence of Hippocrates seems to have been directed always towards the effacement of superstition and the founding of medicine on truth and fact alone. His influence seems to have had no effect as regards the practice of incubation, for it continued through Pagan and into Christian times.

As the East was Christianised the cult of Asklepios was the last to disappear, but the healing went on in the same manner (excepting that the sacred serpents seem to have vanished). The Panagia, or a Christian saint, took the place of Asklepios, and incubation went on unchanged. The practice spread over large parts of Europe, and was even to be found in England during the Dark Ages.

It still exists on many of the islands and on some of the shores of the eastern Mediterranean. Details of the ancient and modern practice of incubation are to be found in the writings of Dr. Rouse and Miss Hamilton, who have both devoted close attention to this curious usage.

An interesting feature of the life of these ancient health resorts was the provision made for the entertainment and amusement of the sick visitors. A great open-air theatre was always at their disposal, where the works of the Greek dramatists would wile away many an hour of weariness and languor.

In later times an Odeon, or music-hall, was sometimes provided. The races of the stadium and the exercises of the gymnasium and palæstra would be good for many of the youthful convalescents to take part in, and amusing for others to witness. The health temples were usually placed in elevated situations, where pure mountain breezes would invigorate the visitant, and pure, fresh water was

abundant. Beautiful country scenery, as well as masterpieces of architecture and art of other kinds in the precinct, would attract his attention, awaken his interest, and tend to prevent him dwelling too much in thought on his own ailments. There can be little doubt that the sick were in general much benefited by their residence at the Asklepieia of ancient Greece.

THE SNOW-PEAKS OF RUWENZORI.

THE paper read by the Duke of the Abruzzi at the special meeting of the Royal Geographical Society on January 12, of which a short report was given in NATURE for January 17 (p. 282), has been printed in full in the February number of the *Geographical Journal*, accompanied by a small selection of Signor Sella's striking photographs. One of these, showing the highest summits of the range, we are enabled to reproduce herewith by the courtesy of the editor of that journal. The twin peaks in the background on the left are the culminating points of the whole range, named by the Duke after the queens of Italy and England. They belong to the group of peaks named by him Mount Stanley, while the remaining summits shown in the photograph form together the group to which the name Mount Baker is applied, the highest point of which is King Edward Peak (the most central in the picture). As is well shown, the two *massifs* (like the whole six which constitute the snowy portion of the range) are separated by a comparatively deep depression, to which the name Scott Elliot Pass has been given by the Duke.

The Highest Peaks of Ruwenzori.

The paper as printed supplies information as to the basis for the determination of the heights of the snow-peaks, fourteen of which were climbed by the Duke. With one exception, they all depend on observations with the mercurial barometer referred to Bujongolo as a lower station, which again was linked with Fort Portal, and through this with Entebbe, by barometer readings as nearly simultaneous as possible. Some of the heights above Bujongolo were also fixed by Captain Cagni by vertical angles, the results agreeing closely with those of the barometer observations. The Duke's figures are mostly about 100 feet to 200 feet in excess of those derived from Captain Behrens's triangulation, and it is possible that when the altitude of Fort Portal above the Victoria lake has been fixed trigonometrically, a small correction will have to be applied throughout. The general accordance in the heights of the six separate *massifs* is somewhat striking, none falling below 15,000 feet, while the highest point of all is only 16,816 feet. None of the peaks offers any serious difficulties to the climber, for the Duke says that the obstacles met with during the ascent of the Queen Margherita peak could have been avoided by another route.

The Duke's conclusions as to the geological history of the range were summarised in our former article, but it may be added here that attention is directed to the probable existence of internal fractures traversing the whole range in a generally north-south direction, which would account for the separation of the several groups of summits. The general hydrographic system can be grasped from the

rough sketch accompanying our former report, which shows how the Bujuku derives its supplies from a much larger part of the snowy area than does the stream hitherto considered to be the upper course of the Mobuku. The Duke was not able to define so clearly the drainage on the side of the Semliki, but he says that the streams flowing west from the four main passes leading in that direction all unite to form the Butagu, the valley of which has been the usual line of approach to the snows on this side. In the Ice age the whole of the valleys of the Bujuku, Mobuku, and Mahoma (south of, and parallel to, the Mobuku) were filled with glaciers of the first order, which must have united and descended the Mobuku valley for some distance. Similarly, glaciers descending from the three southernmost of the groups must have united to form a great westward-flowing ice-stream. At present the lowest point reached by a glacier (that which feeds the Mobuku) is 13,682 feet. The permanent snows are included in a circle ten miles in diameter.

It should be mentioned that the Royal Geographical Society proposes to apply the Duke's name to the most southerly of the snowy *massifs*, instead of that of Thomson, who himself never saw Ruwenzori, important as his work was for the general opening up of this part of East Africa.

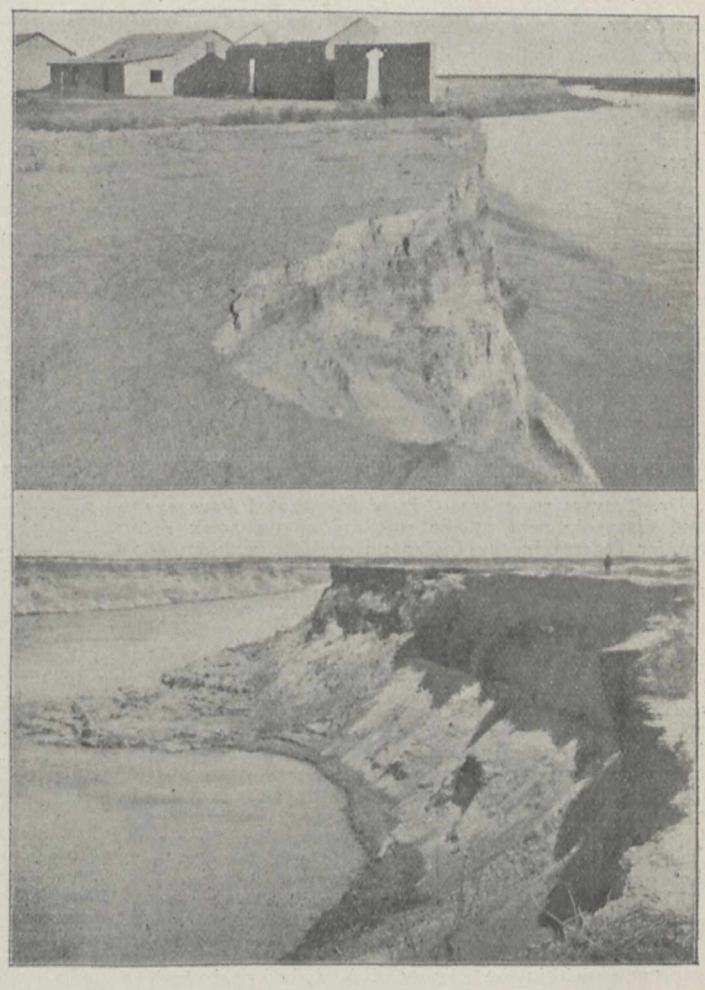
MAN AND SUPERMAN.

MR. ARTHUR J. DAVIS, of the U.S. Reclamation Service, describes in the *National Geographic Magazine* for January the startling changes that are now taking place in the region north of the Gulf of California. For 150 miles from the apex of the gulf, an area of delta and alluvium and old sea-bottom extends to the north-west between the mountains. The upper part of this basin forms the Imperial Valley, and lies in the territory of the United States. Below the Mexican frontier, the Colorado River, emerging from the hills, has built up a huge alluvial barrier above the level of the land to the north of it. This in its growth cut off the head of the ancient gulf, and led to the gradual disappearance of the water by evaporation.

The Imperial Valley thus came into existence, with part of its floor 300 feet below the level of the adjacent sea, and a variable lake without an outlet, the Salton Sink, at its northern end. From time to time the Colorado River, in seasons of flood, has diverted itself from the elevated delta into the Salton Sink, and the lake has grown in consequence. At other times it has banked itself out of this region, has flowed again into the Gulf of California, and has left its temporary northward-running channels, the Alamo and New Rivers, practically dry and sand-filled.

The ease with which the northern lowland could be irrigated led to the formation of a canal about seven years ago. Its mouth, however, became silted up, and a spot was then selected above a steeper slope, where the velocity of the water leaving the Colorado was greater and more effective. In May, 1905, however, the first serious flood-waters deepened this new channel, and supplied far more water northward than was required. The "Salton Sea" rose rapidly, and the Southern Pacific Railroad along its margin was equally rapidly moved to higher ground. Striking alterations occurred in the old valley-floors as they were invaded, and the cataract of the New River, cutting its way back to the frontier town of Calexico, flowed there in a channel 45 feet below the level of the farm-lands. The peril became so great in 1906 that a huge dam was constructed on the delta, in order to compel the Colorado River to return to its former route into the Gulf of California. Mr. Davis's account of this titanic struggle—the printer makes him speak of "herculanean efforts"—forms very interesting reading. The dam having been completed last November, it was estimated that the enlarged "Salton Sea" would dry up in about twelve years; but in December the water of the Colorado worked its way round the dam, and resumed its rush into the Imperial Valley.

The great cataract in the New River was in January eating its way backward, that is to say southward, at the rate of a mile in three days, with a width of some 1700 yards and a fall of 100 feet. The farms in the Imperial Valley are unable to avail themselves of the water so copiously supplied, since it lies below their level; a great inland sea is arising, and dispossessing the railroad and the people whom it serves; and the probability of the diversion of the whole Colorado River northward threatens to deprive of water the settlers in Arizona and Mexico from the Grand Cañon down to the Gulf of California. It needs the philosophic spirit of a Lyell to regard physiographic changes of such magnitude with admiration rather than dismay.



Upper figure.—Partial destruction of the town of Mexicala, Mexico, by the New River.
Lower figure.—The New River cutting into the farm-lands near Imperial, California, forming banks 70 feet in height, which are constantly falling in.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Lord Curzon was elected Chancellor of the University on Thursday, March 14. The votes recorded were:—Lord Curzon, 1101; Lord Rosebery, 440. There are 6576 members of Convocation, so that about one-quarter of them came to Oxford to vote. Lord Curzon was a commoner of Balliol, afterwards a fellow of All Souls', and he gained the Lothian and Arnold prizes. He received an hon. D.C.L. in 1904 on the occasion of the late Chancellor's installation.

The statute brought forward in Congregation on May 12 to provide an official residence for the Savilian professor of astronomy adjoining the observatory in the parks was lost by 55 votes to 156. In the course of the debate on the proposal, the Warden of All Souls', one of the Radcliffe trustees, stated that the trustees would welcome a scheme for the cooperation of the University and Radcliffe Observatories.

CAMBRIDGE.—A lecture will be given by Sir Frederick Lely on "The Practical Side of Famines in India" on Wednesday, April 24, at 5.30 p.m., in the museum of archæology. The lecture will be open to members of the University and others who are interested in the Indian Empire.

THE King of Spain has, *La Nature* reports, created a chair of automobilism at l'École des Arts et Sciences at Madrid. The professor will be expected to give all the practical and theoretical instruction young chauffeurs require.

A PARAGRAPH referring to the Indian Institute of Science appeared in the *Pioneer Mail* a few weeks ago, and was printed in an abridged form in these columns. Dr. Morris W. Travers, F.R.S., director of the institute, writes to say that he has had numerous applications for admission to the institute, so the statement in the *Pioneer Mail*, that it will be difficult to obtain students, is scarcely correct. As to the standard required for degrees in Indian universities, Dr. Travers remarks:—"It is true that I have expressed disappointment at the standard of the work required for degrees in the Indian universities, and am of the opinion that the practical teaching is quite inadequate. I have met only one research student, and have heard of one other."

A CONFERENCE on the teaching of hygiene and temperance in the universities and schools of the British Empire will be held in London on St. George's Day, April 23. The conference is convened by a committee formed to stimulate general interest in the scientific teaching of hygiene and temperance as an integral basis of national education, and to bring before the country during the visit of the Colonial Premiers information as to what is being done in various parts of the Empire. Among the members of the committee are Sir Lauder Brunton, Sir Thomas Barlow, Sir Victor Horsley, Mr. Mayo Robson, Dr. Claude Taylor, and Prof. Sims Woodhead. Further information and tickets of admission to the conference may be obtained from the honorary organising secretary, Miss St. John Wileman, 11 Chandos Street, Cavendish Square.

A RECENT article in the *Pioneer* of Allahabad deals with the work and usefulness of the Thomason Civil Engineering College at Roorkee, United Provinces, which is the leading engineering college in India. In 1891 the college was transferred from the Public Works Department to the Education Department, affiliated to Allahabad University, and its educational staff strengthened on the purely scientific side. The Government of the United Provinces has decided again to extend the college, and the improvements will call for an expenditure of three and a half lakhs. The important part which a properly organised technical institution may play in industrial development should be borne in mind when the extensions or changes at Roorkee are under consideration. Higher technical education is, of course, costly to provide, but the development of technical institutions on broad scientific lines is an urgent need in India, and in endeavouring to meet it the close relation between pure and applied science must be remembered. It is to be hoped that further developments at Roorkee will continue along the lines proved to be successful at home, and result in a strengthening of Thomason College and other Indian educational institutions.

THE council of King's College, London, with the assent of its court, has concluded an agreement by which the departments of the college dealing with arts, laws, science, engineering, and medicine (preliminary and intermediate studies) are to be incorporated in the University of London on terms similar to those recently adopted in the case of University College. An indispensable condition to the incorporation of the college is the raising of a sum of 125,000*l*. Of the sum in question, 22,000*l*. is needed to pay off the debt on the college, 37,000*l*. to pay off the debt on King's College School, which will thereafter be placed under separate government, and 66,000*l*. to form an endowment fund and enable the college to occupy the whole of its premises. An appeal is being made to the public to provide this amount. The appeal has been endorsed by the Senate of the University of London, and already encouraging promises of support have been given. The Goldsmiths' Company and the Clothworkers' Company have each given 5000*l*. In addition to the 125,000*l*., the council asks for 20,000*l*. for the endowment of the theological department. Donations may be given generally to the fund in aid of the incorporation of King's College in the University of London, or else to any of the specific objects above mentioned. No sum will be devoted to the theological department unless specially given for that purpose.

THE eleventh annual distribution of prizes and certificates to the students of the day college and evening classes of the South-Western Polytechnic, Chelsea, took place on March 15. In the unavoidable absence of the Lord Chief Justice (Lord Alverstone), Sir Owen Roberts presented the awards. The principal, in the course of his report on the session 1905–6, spoke of the satisfactory character of the work carried on, and directed special attention to the large increase of student entries in the natural science department. He referred to the need which existed for more continuous work on the part of the students, and instanced the fact that during last session the average hours worked by each adult student in the day classes was only 234, or the equivalent of eight weeks' full work out of thirty-six weeks possible. The institute's record in respect of examination honours and degrees had been well maintained. The equipment of the various departments had been largely increased, and was being rapidly brought up to the standard of modern requirements. Sir Owen Roberts, in addressing the students, expressed satisfaction at the close relationship between the institute and London University. He urged the desirability, in the case of persons actively engaged, of some study to take them outside their ordinary occupation, and which was provided by the scheme of work carried out in the institute.

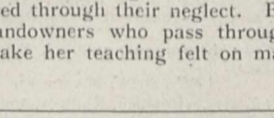
THE inaugural lecture of the new Sibthorpian professor in the University of Oxford develops a plea for the reconsideration of agriculture by the University. Although Dr. Somerville has been appointed professor of rural economy, his present duty is to lecture upon forest botany, and he makes it clear that this is not his own interpretation of the term "rural economy." Those who read this lecture will agree that a good case is made out for agriculture as a university subject. Dr. Somerville, as becomes a new professor, contents himself with making suggestions. Outsiders interested in the development of agriculture will probably wish that it had been possible to make demands, for it is surely time that Oxford was doing something for agriculture. The first page of this lecture tells us that Sibthorp endowed the chair in 1796; we read further that for a century it was the only university chair of its kind in England; but when, after following Dr. Somerville's account of the progress of agricultural education during this century, we pause and ask what Oxford's share has been, we find that it has been practically *nil*. Occasional lectures have been given, and once or twice attempts have been made to introduce an agricultural course, but the University has rejected the schemes of the advocates of agriculture; and now, no

years after Sibthorp's foundation, Oxford's new professor is pointing out that while sixteen of the twenty-five university graduates recently appointed to the Indian Agricultural Department have been trained in Cambridge and Edinburgh, "Oxford has not supplied a single candidate for these Imperial posts." We should like to urge reconsideration of the subject on other grounds. Agriculture needs the support of the English universities, and in the past it has suffered through their neglect. By her influence on the young landowners who pass through her colleges Oxford might make her teaching felt on many an English estate.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, March 7.—Prof. R. Meldola, F.R.S., president, in the chair.—The constitution of chaulmoogric and hydnocarpic acids: M. **Barrowcliff** and F. B. **Power.** A study of the oxidation products of chaulmoogric acid leads to the conclusion that it exists in a state of tautomerism between 1-α-carboxy-*n*-dodecyl-Δ^4-*cyclo*pentene and 1-α-carboxy-*n*-dodecyl-1 : 4-*bicyclo*pentane. Hydnocarpic acid, $C_{16}H_{28}O_2$, is a homologue of chaulmoogric acid. Its constitution may accordingly be represented by the following formula:—



—Hydrolysis of amygdalin by acids: R. J. **Caldwell** and S. L. **Courtauld.** The authors have studied the action of acids in comparison with that of enzymes on this "bioside," and the results show that though amygdalin is ultimately resolved by acids into hydrogen cyanide, benzaldehyde, and two molecular proportions of glucose, the separation of the glucose is effected in two stages. By carefully hydrolysing amygdalin by means of a normal solution of hydrogen chloride at 60°, the authors have prepared mandelonitrile glucoside.—Mandelonitrile glucosides. Prulaurasin: R. J. **Caldwell** and S. L. **Courtauld.** Fischer's glucoside bears the same relation to prulaurasin as amygdalin bears to the *iso*amygdalin described by Dakin, which is to be regarded as the derivative of inactive mandelonitrile, amygdalin and Fischer's glucoside being derived from *l*-mandelonitrile. Sambunigrin must be regarded as the β-glucoside of *d*-mandelonitrile.—The hydrolysis of amygdalin by emulsin: S. J. M. **Auld.** The hydrolysis of amygdalin by emulsin may proceed in three ways, depending on the mode of attachment of the emulsin. The experiments so far carried out by the author indicate that benzaldehydecyanohydrin and the αβ-disaccharide are formed, and the latter then resolves into two molecules of dextrose.—Electrolytic reduction, part iii.: H. D. **Law.** The products of electrolytic reduction of the aromatic aldehydes in alkaline solution are compounds of the hydrobenzoin type, but this reaction is completely altered when a methyl group is substituted in the *ortho* or *meta* position of the benzene nucleus. Compounds of a resinous nature are obtained in the latter case.—New cerium salts: G. T. **Morgan** and E. **Cahen.** The aromatic sulphonates of this element are usually soluble, crystalline compounds resembling the thorium sulphonates previously described by one of the authors.—Volume changes, which accompany transformations in the system $Na_2S_2O_3 : 5H_2O$: H. M. **Dawson** and C. G. **Jackson.** The changes, which take place in the system $Na_2S_2O_3 : 5H_2O$ when subjected to certain temperature variations, have been investigated by the dilatometric method.—Depression of the freezing point of aqueous solutions of hydrogen peroxide by potassium persulphate and other compounds: T. S. **Price.** Potassium persulphate causes a less molecular depression of the freezing point of aqueous solutions of hydrogen peroxide than it does of water, and the conclusion is drawn that an unstable compound is formed in solution.—The formation and reactions of imino-compounds, part iii., the formation of 1 : 3-naphthylenediamine and its derivatives from *o*-toluonitrile: E. F. J. **Atkinson,** H. **Ingham,** and J. F. **Thorpe.**—The action of ethylene dibromide and of propylene dibromide on the disodium derivative of diacetylacetone: A. W. **Bain.**

Mathematical Society, March 14.—Sir W. D. Niven, vice-president, in the chair.—Mr. G. W. **Evans-Cross** exhibited his calculating machine, the myriometer. The instrument has several different forms, which are all, in principle, modifications of the slide-rule. In the form in which the instrument can be used for multiplication, the rule consists of a number, equal to that of the digits in one factor, of slips placed diagonally in a frame, and the slide carries as many cursors as there are digits in the other factor. The instrument will give exact results for numbers of six or eight digits. In other forms the instrument can be used for various calculations relating to commerce, such as the reduction of the interest on a stated sum from one percentage to another. In another form slides can be set so as to give the calendar of any year, B.C. or A.D., and all the new moons of the year.—Invariants of the general quadratic form *modulo* 2: Prof. L. E. **Dickson.** Complete sets of independent invariants, and also of linearly independent invariants, are obtained for quadratic forms of not more than five variables in the field of order two, and those invariants of quadratic forms of six variables which can be deduced are also given. It is shown that the complete classification of quadratic forms can be accomplished by means of invariant functions.—Linear partial differential equations of the first order: J. **Brill.** The paper is occupied with a general review of the theory and an endeavour to ascertain the relations of exceptional solutions to the solutions of classified types.—The reduction of the factorisation of binary septans and octans to the solution of an indeterminate equation: Dr. T. **Stuart.**—An informal communication on the representation of functions by means of series of a special type was made by Prof. A. E. H. **Love.**

PARIS.

Academy of Sciences, March 11.—M. Henri Becquerel in the chair.—Some details of the spectroheliograph: H. **Deslandres.** Remarks on a recent paper by M. Millochau in the *Comptes rendus*. Many of the details described by M. Millochau as new have been used by the author for years, and further details of working are now added.—A new contribution to the study of the stinging flies of intertropical Africa: A. **Laveran.** A detailed account of the various species found in the districts of Senegal, Mauritania, the Upper Senegal and Niger, French Guinea, the Congo Free State, and Mozambique.—The direct dehydration of dimethyl-isopropyl carbinol: Louis **Henry.** The dehydration of this alcohol might be expected to give rise to pure tetramethylethylene, and it was with this object in view that the experiments were carried out. The reaction proved to be not quite so simple, the fractionation of the hydrocarbons obtained by the action of acetic anhydride upon the alcohol giving tetramethylethylene and methyl-isopropylethylene, the former hydrocarbon being about three-quarters of the total product.—Some new results obtained in the detection and estimation of methane: Nestor **Gréhant.** An improvement of an apparatus previously described.—The perpetual secretary announced the death of François Joseph Herrgott, correspondant for the section of medicine and surgery.—A new comet: M. **Giacobini** (see p. 498).—The elastic deformations which leave invariable the lengths of a triple infinity of right lines: G. **Kœnigs.**—Waves of shock and combustion. The stability of the explosive wave: MM. **Crussard** and **Jouguet.** It is assumed that the combustion is incomplete in the wave, but is completed behind adiabatically and reversibly according to the law of dissociation, and the consequences of this assumption are worked out.—The conditions of formation of electrified centres of feeble mobility in gases: Maurice **de Broglie.** Experiments on carbon monoxide flames and flames containing hydrogen lead to the conclusion that the presence of centres of feeble mobility in the gases issuing from flames appears to be related to the production in the flame of solid or liquid products, or to the presence of some centres previously existing in the normal state in the atmo-

spheric air.—A contribution to the study of the latent photographic image: Eug. **Demole.** Some experiments on the reversal of the image caused by the presence of a feeble oxidising agent, such as potassium ferricyanide. The author puts forward a theory of the process based on the formation of a hypothetical silver hypobromite.—An exact method of separating ammonia and methylamine: Maurice **François.** The method is based on the fact that ammonia is readily absorbed by yellow oxide of mercury, whilst methylamine is not acted upon by this reagent.—The constitution of the azo-derivatives of ethyl benzoylacetate: A. **Wahl.**—The β-chlorethyl and vinyl ketones: E. E. **Blaise** and M. **Maire.**—The influence of manganese salts on alcoholic fermentation: E. **Kayser** and H. **Marchand.** The effect of adding manganese salts to a fermentable liquid is to increase the amount of sugar fermented, the yields of alcohol, glycerine, and volatile acid all being greater.—A new glucoside, hydrolysable by emulsin, extracted from the seeds of a Strychnos from Madagascar: Em. **Bourquelot** and H. **Hérissey.** The name bakankosine is given to the new glucoside, and its method of preparation, properties, and products of hydrolysis are given in detail.—The cytological peculiarities of the development of the mother cells of the pollen of *Nymphaea alba* and *Nuphar luteum*: W. **Lubimenko** and A. **Maige.**—The ecological characters of the vegetation in the eastern region of the Kabyle and Djurjura: G. **Lapie.** The forest vegetation in this region presents well-characterised zones standing clearly in relation with the climatological, topographical, and edaphical conditions.—A phenomenon of plant pseudomorphosis analogous to the pseudomorphosis of minerals: N. **Jacobesco.**—A spiky formation characteristic of the last dorsal vertebra in man: R. **Robinson.**—The tectonic north of Meurthe-et-Moselle: René **Nicklès** and Henri **Joly.**

CALCUTTA.

Asiatic Society of Bengal, February 6.—The exact determination of the fastness of the more common indigenous dyes of Bengal and comparison with typical synthetic dyestuffs, part i., dyeing on cotton: E. R. **Watson.** The author gives a summary of the available evidence as to the fastness of the indigenous Bengal dyes, and points out that this evidence is wanting in precision and is in many cases self-contradictory. The author has prepared samples of cotton dyed with the more common Bengal dyes, so far as possible according to native methods, and has tested the fastness of these dyeings (1) to light, (2) to washing with soap, (3) to alkalis, (4) to dilute acids such as perspiration, testing at the same time by the same methods a representative collection of dyeings with synthetic materials. Tables are given in which the fastness of each dyeing under each condition is expressed quantitatively. The dyestuffs turmeric, safflower, *palas* (*Butea frondosa*), *latkan* (*Bixa Orellana*), red sandal (*Pterocarpus santalinus*), and *padauk* (*Pterocarpus dalbergioides*) are of very inferior fastness. *Manjista* (*Rubia cordifolia*), catechu (*Acacia catechu*), and *bakam* (*Caesalpinia Sappan*) compare favourably with the great majority of synthetic dyes.—*Breynia vredenburgi*, an undescribed echinoid from the Indian Ocean: Major A. R. S. **Anderson.** The genus Breynia was founded in 1847 by Desor, for Spatangidæ, characterised by the simultaneous presence of the three kinds of fasciole, internal, peripetalous, and subanal. Only one living species had hitherto been described, *Breynia australasiae*, from the Pacific Ocean. Another species was discovered by Major Anderson at Port-Blair, in the Andamans, and has been named *Breynia vredenburgi*. The original specimen is now in the Indian Museum.—Note on the common raven (*Corvus corax*): Lieut.-Col. D. C. **Phillott.**

DIARY OF SOCIETIES.

THURSDAY, MARCH 21.

ROYAL INSTITUTION, at 3.—Biology and Progress: Dr. C. W. Saleeby.

CHEMICAL SOCIETY, at 8.30.—The Synthesis of Polypeptides: Emil Fischer.—Organic Derivatives of Silicon, Part iii., *dl*-Benzylmethylethylpropylsilicane and Experiments on the Resolution of its Sulphonic Derivative: F. S. Kipping.—On the Reduction of Carbon Dioxide to form Aldehyde in Aqueous Solutions: H. J. H. Fenton.—The Mechanism of the Rusting of Iron: G. T. Moody.—Some Compounds of Guanidine with Sugars, Part i., R. S. Morrell and A. E. Bellars.

LINNEAN SOCIETY, at 8.—On the Origin of Angiosperms: E. A. Newell Arber and John Parkin.—*Exhibitions:* Water-colour Sketches of Alpine Flowers: Miss Helen Ward.—Photographs of Transvaal Trees and Tree Scenery: J. Burtt Davy.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Rail Corrugation: J. A. Panton.

FRIDAY, MARCH 22.

ROYAL INSTITUTION, at 9.—Rays of Positive Electricity: Prof. J. J. Thomson, F.R.S.

PHYSICAL SOCIETY, at 5.—Experimental Mathematics: Mr. Pochin.—Logarithmic Lazytongs and Lattice Works: Mr. Blakesley.—A Micromanometer: Mr. Roberts.—Electrical Conduction produced by heating Salts: Mr. Garrett.

INSTITUTION OF CIVIL ENGINEERS, at 8.—A Point in Turbo-Alternator Design: F. J. Kean.

SATURDAY, MARCH 23.

ROYAL INSTITUTION, at 3.—Röntgen, Kathode, and Positive Rays: Prof. J. J. Thomson, F.R.S.

MONDAY, MARCH 25.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Photographic Report of a Journey through the Highlands of Duab (Zarafshan, &c.): W. Rickmer Rickmers.

INSTITUTE OF ACTUARIES, at 5.—On the Relation between the Theories of Compound Interest and Life Contingencies: J. M. Allen.

TUESDAY MARCH 26.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Application of Hydro-Electric Power to Slate Mining: M. Kellow.—Electrically Driven Winding Gear and the Supply of Power to Mines: A. H. Preece.

WEDNESDAY, MARCH 27.

GEOLOGICAL SOCIETY, at 8.—On the Southern Origin attributed to the Northern Zone in the Savoy and Swiss Alps: Prof. T. G. Bonney, F.R.S.—The Coral-Rocks of Barbados: J. B. Harrison, C.M.G.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

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