THURSDAY, NOVEMBER 27, 1913.

A LESSON FOR ENGLAND.

Japan's Inheritance. The Country, Its People, and Their Destiny. By E. Bruce Mitford. Pp. 384+plates. (London: T. Fisher Unwin, n.d.) Price 10*s.* 6*d.* net.

THE author of this account of the country of Japan has not only travelled through it with the observing eye of a geographer, but he has consulted the best papers which have been published by geologists and experts in seismology. He gives what seems to be a true account of the position of Japan among the nations, and of her ambitions. Travellers will find the book a useful addition to the books which give the impressions of the globe-trotter, but the author cannot be said to have made more than a superficial study of the social phenomena exhibited by Japan in the last forty-five years.

The Mikado was a combination of a *roi-faineant* and a god; the Shogun was the ruler of a feudal state; religion was Confucianism or Buddhism, permeated by Shintoism, which in a few words may be said to be really patriotism and ancestor teachers of ancient classics. The structure was in many ways beautiful, but it proved to be without physical strength. Its extreme weakness proved its salvation. Even the teachers of classics saw that for a poor nation to be strong, scientific method must permeate the thought of the whole population. And now, at the end of the first chapter in Japan's modern history we find a nation which can not only defend itself, but which retains all of its religion that was beautiful. Every unit of the population can not only read and write, but it is fond of reading, and its education did not cease when it left school. It is getting an increased love for natural science, so that it can reason clearly; it is not carried away by charlatans; it retains its individuality. One result of this is that in time of war Japan has scientific armies. Not only are its admirals and generals scientific, but also every officer, every private is scientific. The accounts of many of our European wars must seem to a Japanese like a Gilbert and Sullivan opera. The country is naturally very poor, and its finance requires twenty times the wisdom which has been found sufficient for any European Chancellor of the Exchequer, but such wisdom is now obtainable in Japan. Everything in the whole country is being developed scientifically, and we Europeans, hag-ridden by pedantry in our schools and universities, refuse to learn an easy lesson.

Japan's present aim is quickly to make herself strong in war. She has other aims. The Japanese knows that his ancestors were highly civilised when our ancestors were savages in the Baltic forest, but Japan forgoes her higher aims until she is strong enough to be respected.

J. P.

MOLECULAR PHYSICS.

Die Existenz der Molkule. Experimentelle Studien. By Prof. The Svedberg. Pp. viii+243+iv plates. (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1912.) Price 12 marks.

THE molecule, originally conceived as the basis of chemistry, and apparently firmly established as the foundation of the kinetic theory, was at the end of last century no longer the centre of progress. When, therefore, W. Ostwald suggested that it no longer played an essential part in chemical theory, he found many German chemists ready to deny its existence. About this time Prof. Svedberg began the experimental researches which are described in this book. It is therefore not surprising that he takes the proof of the reality of molecules as the central idea, to which all his experimental work is referred.

The volume serves chiefly as a record of the author's own work, but includes brief references to the results obtained by others in the same field, and also an enumeration of the various methods by which molecules have been made manifest in the last few years. It has been divided into two sections. The first section deals with phenomena which concern molecules in the aggregate. Here experiment must usually be interpreted in terms of the kinetic theory. The author's work on the diffusion of colloids gives in this way a remarkably good estimate of the weight of a molecule, while from the diffusion of some true solutions a guess may be made at the shape of the molecules concerned. The absorption of light by colloids provides complicated, but very interesting results of which the most important from the author's point of view is the fact that the behaviour of the smallest colloid particles approximates to that of a true molecular solution.

In the second section the molecules are dealt with singly. The word molecule has here been liberally interpreted, for the Brownian movements of colloid particles have been included under this heading. Prof. Svedberg was the first to prove experimentally that these movements agree with the calculations made by Einstein and Smoluchowski from the kinetic theory, and half the book is devoted to this subject. By marshalling his own results, and those of others, he shows what a fine proof is thus provided of the

truth of the kinetic theory. When a colloid suspension in water is observed with an ultramicroscope, the number of particles in the field of view is constantly fluctuating, because the particles are moving haphazard. By observing the extent of the fluctuations, the author has been able to test how far the behaviour of the colloid is in agreement with the simple gas laws. He has also invented a most ingenious method of measuring the concentration fluctuations in a molecular solution. A solution of a polonium salt in water is used, and the rate at which α particles are shot off provides a measure of the concentration of the solution. Unfortunately radio-active change is just as haphazard as the movements of molecules, so that the fluctuations in the emission of α particles are due to the two causes combined. Experimental difficulties have been overcome, and the two effects separated, the result being in agreement with the kinetic theory.

This book is not merely a collection of reprints, for the original papers have been re-written into a connected whole, while some of the material had not previously been published. Unfortunately, however, the author has made no attempt at condensation, and the very interesting subject-matter is at times lost in a plethora of numerical results. Considerable tracts, such as pp. 152–164 and 183–195, resemble a laboratory note-book, and even the lucid descriptions of experimental arrangements leave too little to the reader's intelligence. In a smaller book the importance and ingenuity of the experimental work would have held the reader's interest. H. G. J. M.

FLIGHT PRINCIPLES AND PRACTICE.

(1) *The Flight of Birds.* By F. W. Headley. Pp. x+163+xvi plates in text. (London: Witherby and Co., 1912.) Price 5*s.* net.

(2) *The Mechanics of the Aëroplane.* A Study of the Principles of Flight. By Capt. Duchêne. Translated from the French by J. H. Ledeboer and T. O'B. Hubbard. Pp. x+231. (London: Longmans, Green and Co., 1912.) Price 7*s.* 6*d.* net.

(1) MR. HEADLEY is well known, in the Aëronautical Society and outside it, for his interesting studies of bird flight. If he has not much that is novel to say about the more controversial points on which some difference of opinion still remains, he is yet able to write very pleasantly and instructively, and often from his own observation, about all the main features of bird flight; and the series of the author's photographs selected for reproduction makes one wish for more.

The point of view throughout is that of the interested and intelligent observer, describing and so far as possible explaining his observations. The explanations are given in the simplest possible manner, and are as clear as need be. The opening chapter on gliding flight might perhaps be improved in the light of the most recent knowledge, but the criticism is of no importance; the book is written for the lover of nature, not the technical expert. The questions dealt with include stability and steering, starting and alighting, soaring, pace and endurance, varieties of wing and of flight, flight machinery and some accessory characteristics. It is a volume which will be read with pleasure by those interested in flight, and in birds.

(2) The purpose of this book, in the words of the translators' preface, is "to explain in terms as simple as possible, and with a minimum of formulæ, the main principles of dynamic flight; to give the ordinary reader an insight into the various problems involved in the motion and equilibrium of the aëroplane; and to enable him to calculate in the simplest possible manner the various elements and conditions of flight." Judged from this point of view, the book is one which can be cordially commended to the "ordinary reader," for whom it is written. The elementary principles of aërodynamics applicable to the aëroplane as expressed by the usual formulæ derived from experimental observation, are given in their simplest, approximate, form; and the logical deductions which can be made from these formulæ are explained with care and conciseness. All the main points of importance can be brought out in this manner, and the result will enable the reader who is prepared to take the small amount of trouble required to follow the argument to obtain an intelligent grasp of the conditions under which the flight of an aëroplane can be sustained.

The reader new to the subject will probably be surprised to find how simple and how few in number are the fundamental formulæ and ideas required. These comprise the formulæ expressing the "lift" and "drift" in terms of the velocity and angle of incidence; a little information as to the movement of the centre of pressure; and some general ideas as to the effect of camber, and of aspect ratio. With this apparently slender equipment, and some acquaintance with the laws of elementary mechanics, a tolerably complete discussion is given of the main principles of flight, including even a chapter on the screw-propeller.

The apparent simplicity thus obtained is, indeed, from another point of view, one of the main defects of the book. The simple law assumed for the variation of lift with angle of

incidence might well have been illustrated by the reproduction of a curve showing this variation for some common type of aëroplane wing, giving instructive information as to the limits within which the simple law may be taken to hold. Other similar experimental results available at the time the volume was written might well have been made use of.

Part II. of the work is devoted to consideration of the equilibrium and stability of the aëroplane in still air. These two questions of equilibrium and stability are not kept as distinct as they should be, and we fear some confusion in the mind of the reader must necessarily result. The ideas put forward on the subject of stability are of interest, but the experimental basis is, of course, too slender for any satisfactory examination into this question, which cannot be dealt with in so elementary a manner.

The merits of the original work of Captain Duchêne are well preserved by the translators, both of whom, from their intimate association, both practical and literary, with aëronautics, have special qualifications for their task. The lucidity and terseness of the French are reproduced in the English version, and the choice of equivalents for technical terms is particularly happy.

OUR BOOKSHELF.

The Archaeology of the Anglo-Saxon Settlements. By E. Thurlow Leeds. Pp. 144. (Oxford: Clarendon Press, 1913.) Price 5*s*. net.

THIS book is suggestive, in the sense that while it raises many interesting problems, the material at present available does not admit their complete solution. Dealing with a period of about 200 years, from the first coming of the Saxon invaders down to the cessation of the evidence furnished by the pagan interments, Mr. Leeds attempts, from a survey of the archæological remains, to supplement and correct the literary record. These historical sources are admittedly much later than the events of the early invasions which they profess to record—Prosper Tiro, Gildas, Procopius, and Zozimus belonging to the fifth and sixth centuries, followed by Bede and the Anglo-Saxon Chronicle.

Mr. Leeds' method is to study the remains discovered in interments both in Great Britain and on the Continent, and to discuss their bearing on the historical record. The chief difficulty lies in the comparative scarcity of remains in the period which he is investigating, and, in the case of objects of art, like jewelry and metal-work, of discriminating between objects which may have passed from one tribe to another in the course of trade, and those which can with certainty be attributed to certain races or areas. The book bears the marks of rigid compression. A more extended narrative, a larger amount of illustration, better maps, and occasional summaries of conclusions, would make it easier reading. It may be hoped that he will be encouraged to treat the subject in more detail, and that the publication of the book will lead to more active search for remains of the Anglo-Saxon pagan age.

Even with these reservations, the book is a useful contribution to archæology. In some cases, as regards the early history of the West Saxons and the occupation of the Isle of Wight, the evidence of archæology is in direct conflict with current history. Among many intersting conclusions we may note that the distribution of the early settlements is based on the English river-system, and that the invaders avoided Roman roads and cities, partly with deliberate strategical intent, partly from a desire to place water between them and the ghosts supposed to haunt places destroyed by fire and sword. The female interments, as might have been expected, provide more interesting remains, in the form of jewelry and other ornaments, than those of males.

On the whole, the book is a valuable contribution to the early history of these islands, and its conclusions will deserve the serious consideration of future writers on this obscure period.

The Romance of Scientific Discovery. By C. R. Gibson. Pp. 318 + plates. (London: Seeley, Service, and Co., Ltd., 1914.) Price 5*s*.

THE title of this book covers an extremely large field, and anyone who attempts to deal with the manifold discoveries in so many branches of science undertakes a difficult task. In spite, however, of the many pitfalls, the author of this work has been fortunate in avoiding them. Mr. Gibson is a well-known writer of popular and non-technical works, and the present volume brings out his faculty of stating facts clearly and making the subjects he deals with interesting. To write about the romance of scientific discovery successfully must necessarily indicate that the author is well versed in the literature of many sciences, and that this is the case is shown by a perusal of the present volume. He has nevertheless taken the opportunity of consulting his many scientific friends who have read in manuscript the particular portions which deal with their special subjects.

The subjects dealt with are most varied, and are treated in twenty-three chapters, each restricted to some specific point. To mention a few, there are essays on discoveries concerning our planet, how the crust of the earth was formed, living creatures of past ages, microbes, discoveries in botany, chemistry, electricity, &c., and discoveries concerning the universe. Care has been taken not to burden the reader with a host of names and dates, and an appendix is given in which further details are mentioned and can be referred to if needed. A capital index is given, and the book is well illustrated with numerous excellent plates. The frontispiece illustrates the large refracting telescope at Treptow, near Berlin, and is described as the largest telescope in the world. The actual largest refractor in the world is that at the Yerkes Observatory, in the United States.

The Bacteriology of Diphtheria. Including Sections on the History, Epidemiology, and Pathology of the Disease, the Mortality caused by it, the Toxins and Antitoxins, and the Serum Disease. By Drs. F. Loeffler, A. Newsholme, F. B. Mallory, G. S. Graham-Smith, G. Dean, W. H. Park, and C. F. Bolduan. Edited by Prof. G. H. F. Nuttall and Dr. G. S. Graham-Smith. Re-issue with Supplementary Bibliography. Pp. xx+718. (Cambridge University Press, 1913.) Price 15*s.* net.

THE first edition of this exhaustive work was reviewed in the issue of NATURE for April 29, 1909 (vol. lxxx., p. 243). The editors point out in the present edition that the conclusions arrived at in the papers which have been published since the first appearance of the volume have mainly confirmed the opinions advocated in it; and consequently they decided only to add a supplementary bibliography of eight pages, recording the most important work published since 1908. In many instances the contents and conclusions of the papers included in the bibliography are indicated sufficiently in their titles; in other cases a brief summary of their contents has been added.

LETTERS TO THE EDITOR.

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

Migration Routes.

THE experience gained from flights on aëroplanes and from the behaviour of airships may throw some light on why migratory birds follow certain routes. Pilots in aëroplanes can easily see rivers and ponds, and these form better guides than roads and railways; main roads, now usually tar-coated, are not conspicuous, while the lighter coloured by-roads are more easily seen. There is evidence that migration routes are often along coast lines and river valleys; these are most conspicuous features in an uninhabited country, and birds when flying in the daytime below the clouds could have no difficulty in following them by sight.

When flying at night, or above the clouds, birds would be able to follow the coast-line by the sound of the waves breaking on the shore. Dr. Gadow believes, both from theoretical considerations and from his observations, that birds have very acute power of hearing faint sounds. Thrushes apparently are able to detect earthworms by the noise they make just before they come out of their holes in the earth. Owls have remarkably well-developed ears, both external and internal, and the silence of their flight perhaps has been partly developed to enable them to detect slight sounds. Birds no doubt appreciate the songs of their mates, and parrots have the power of reproducing sounds with great exactness. Dr. Gadow adds, that judging from the structure of the ear, most anatomists think that the power of hearing in birds is much inferior to that of mammals. He does not, however, agree with this opinion.

Observations on sound from an aëroplane are impossible because of the noise of the engine and propeller. But from a balloon sounds can be heard easily. People shouting have been heard at 4500 ft.; a gun at 8200 ft.; a dog barking at two miles; a band playing at 11,800 ft.; a railway train at 4900 ft.[1] Other observers have noticed the barking of dogs, the crowing of cocks, and the bleating of sheep when high up.

Mr. Griffith Brewer heard on one occasion the sound of the sea breaking on the shore. He was over the English coast with an offshore wind and a calm sea underneath him, and the sound he heard came from the breaking of the waves on the French coast at least twenty-five miles away. He was amongst the clouds in falling snow, and could see nothing. As the wind carried him along over the sea the sound of the waves gradually increased, and this was the only assurance of his continued approach to the French coast.

Even in calm weather the sound of the waves would be easily heard by birds when at a considerable height. Those who have lived a short distance inland are familiar with the sound from the shore on calm nights. When there is much wind the waves breaking are not heard because of the sounds produced by the wind in the trees or buildings near. The intensity of the sound from a single source, such as a dog barking, will vary inversely as the square of the distance, but if the sound comes from a line instead of a point its intensity will only vary inversely as the distance. Mr. Mervyn O'Gorman has pointed out that this is one of the reasons which accounts for the great distance to which the sound from the sea breaking on the shore will carry.

Osborne Reynolds has discussed the refraction of sound caused by wind and also by the variation of the temperature of the air at different heights above the ground.[2] The refraction caused by wind reduces the carrying power of the sound to a place on the earth's surface to windward. Usually the temperature of the air falls with increasing height, and this reduces the carrying power of the sound in all directions to places on the earth's surface. When the direction of the sound makes a large angle to the surface of the earth the intensity of the sound will not be reduced. On one occasion during his experiments the calls from the occupants of a boat were heard on a yacht more than five miles distant. In this case the direction was horizontal, and no doubt the conditions were exceptionally favourable for the transmission of sound, but we should expect the conditions generally to be good for the transmission of sound in an upward direction, where there are no solid objects to make sound shadows.

It seems then that birds can have little difficulty in following coast-lines by day or night.

Migrating birds, however, can only follow rivers by sound when these are so wide as to have waves breaking on their shores or so rapid that sufficient noise is made by the water tumbling over rocks.

Mr. Griffith Brewer tells me that at night ponds and rivers are indistinguishable from grass fields even in bright moonlight, except that the surface of the water acts as a mirror in which the brilliant reflection of the moon or even of a star is seen. This can only be an efficient guide to migrating birds on moonlight nights with a clear sky and when they are flying in such a direction that the image of the moon in the water is within their field of vision. Most birds have their eyes at the sides of their heads,[3] and this would give them the power of watching the reflection of the moon in a river or sea when it is

[1] Report on Eight Balloon Ascents in 1862 by James Glaisher, F.R.S. B.A. Report, 1862, p. 490.

[2] See "Papers on Mechanical and Physical Subjects," by Osborne Reynolds, F.R.S., pp. 89 and 157.

[3] Certain carnivorous birds have their eyes more in front; birds follow the same general rule as other animals; the eyes of the hunter are in front which must help him to see his prey, and the eyes of the hunted are at the side of the head to enable him to watch his pursuer.

almost behind them, whereas man could only see the reflection when flying more or less towards it.

In following these routes birds may also be able to travel with less exertion. When the sun is shining, land is warmer than water; the reverse is the case at night. This difference of temperature causes a downward air current over water on sunny days, and in calm weather this is most markedly felt even when passing over as small a piece of water as the Fleet Pond near Farnborough. This pond is about 1000 yards long and about 700 yards wide at its widest point, and is very shallow. Mr. O'Gorman tells me that on a sunny day a balloon drifted slowly over the pond and at once began to fall with considerable rapidity through a distance of perhaps 2000 feet, and ballast had to be thrown out to prevent it reaching the water. Aëroplanes are sensitive to the down current over quite small ponds on sunny days, and drop in passing over them. We thus have direct evidence of a downward current over a small sheet of water on a sunny day, and this must mean an updraught over the land near the water.

Coast-lines are often marked out by cumulus clouds during the daytime. Dr. Shaw tells me that this is an indication of local rising air currents, and that the bases of clouds of this type are assigned to a height of from 4000 to 5000 ft.

If birds make use of these upcurrents they should fly over the land near the water in the daytime, and if there is a wind they should fly on the windward side of a river. Observations on this point would be of great interest. In windy weather the upcurrent would be much reduced, and perhaps would be inappreciable.

At night we should expect the opposite effect to be produced, but I know of no evidence on this point, and the upcurrent over water may be inappreciable. To take advantage of it, if it exists, birds should fly over water at night, or if there is a wind on the lee side of a river.

An on-shore wind striking against the cliffs produces an upcurrent, and this also birds would find advantageous.

There may be other advantages in valley routes, such as perhaps better conditions with regard to wind, and Dr. Gadow has pointed out to me that many of the birds that follow coast-lines and rivers are aquatic or semi-aquatic, and that even the more terrestrial birds will find better stores of food in river valleys than along the bordering hill ranges.

The foregoing throws very little light on the difficult problems involved in the migration of birds. It is hoped, however, that other and more important observations will be made from aëroplanes and airships, and that these will enable us to understand a little more about the mystery of the migration of birds.

HORACE DARWIN.

November, 1913.

The Elephant Trench at Dewlish.

IN the hope of finding an explanation as to the origin of the so-called elephant trench at Dewlish, Mr. Clement Reid (NATURE, vol. xcii., p. 96), asks if, under desert conditions, there is any tendency for winds to cut trenches with rounded blind ends in soft limestone deposits. Having travelled in the Egyptian and other deserts, and having camped for some months on soft Tertiary limestones in the stormy region at the mouth of the Gulf of Suez, a few remarks from my pen may be of interest in this connection.

The only desert locality where I have seen trenches at all resembling that at Dewlish is in the Jemsa area near the mouth of the Gulf of Suez. On the low flat isthmus which joins the headland of Ras Jemsa to the mainland there are cracks or openings in the soft "Raised Beach" deposits which cover the Tertiary Gypseous limestone formation of this area. The cracks are usually directed N.E.–S.W., and are parallel to the slip-planes which have disturbed the underlying deposits. The prevailing wind, which is strong and persistent, blows from the N.W. off the plain behind the Gebel Zeit range. Part of the sand and dust which it carries is dropped when its velocity decreases, namely in any hollow or wind-shadow that may occur. The cracks above-mentioned, which may be likened to crevasses in glaciers, form one of the receptacles for this wind-borne material, and being thus partially filled and obliterated, are not easily observed, and men and camels have been known to flounder into them. The fact that they are only partially filled shows that they are in process of formation now, and their origin would seem to be due to the solution of both series of deposits along such lines of weakness as joints or slip-planes.

The infilling of hollows is typical of the desert and we know that an artificially excavated hole is not deepened, but, on the contrary, tends to be obliterated by wind-driven sand.

If a rock of uniform texture but containing hard nodules, such as flints, is abraded by sand, the surface is fluted, and small hollows are scoured round the nodule. Mr. Reid's letter does not suggest the presence of such hollows, and their absence must be regarded as another point against the wind-erosion theory.

From the description of the trench, I gather that it occurs, not on the edge of a plateau, but on the surface of the open downs, and thus resembles, as Mr. Reid suggests, the well-known *swallow-holes* of the Great Scar Limestone, which frequently engulf sheep and other denizens of the plateaux. Mr. Reid writes in the singular number, as if only one end of the trench was rounded. This again is a feature common to swallow-holes, where the detritus carried by the disappearing stream abrades only the upstream end of the hole. Is this rounded end so situated with regard to the surrounding chalk topography that it would be possible for a stream of water to have entered the trench from that end? Mr. Reid tells us that open trenches in the chalk are unknown elsewhere; are not the deep and narrow holes in the chalk, now filled with red clay, which are to be seen in the railway cuttings between Cambridge and London, supposed to have the same origin as the *sinks* of the Yorkshire wolds?

As cracks and joints in the chalk are conspicuous by their absence, perhaps the point or line of weakness, which originally determined the position of the trench, has been eroded away completely. The question arises—Is there any relation between the direction of the trench and the direction of the joints in the country rock?

The nature of the bottom of the trench and the relation of the trench to the surrounding topography should tell us something definite as to its possible origin, but in the meantime I think we may regard the wind-erosion hypothesis as untenable.

H. T. FERRAR.

Survey Department of Egypt, November 5.

On a Habitat of a Marine Amœba.

As our knowledge of marine Amœbæ is very scanty it is worth while recording what appears to be a common habitat of one of these animals.

At various times from May to October this year Amœbæ were observed casually in the water obtained by squeezing out the contents of the gastral cavity

of Sycons. Occasionally they were obtained in this way in fair quantity. It was therefore thought probable that a more careful examination of a number of these sponges would be interesting in determining whether this habitat is a usual one. Accordingly twenty specimens of *Sycon coronatum*, varying in length from about 2 to 4 cm., were examined. The contents of the gastral cavities of these specimens were squeezed on to a slide and a careful search for Amœbæ made.

Of the twenty specimens thus examined one or more Amœbæ were found in all except three. Usually about three or four specimens were obtained from each sponge; only one Amœba, however, was found in a few of the squeezings, but from one sponge nineteen of these animals were counted, and doubtless not all those present were seen. It is therefore evident that these sponges are a common habitat of marine Amœbæ, whence these lowly animals may be obtained fairly easily.

There is no likelihood that this habitat is an exclusive one; doubtless Amœbæ occur in a great many other situations in the sea, from which, however, they can only be obtained with some difficulty.

The Amœbæ obtained from the sponges were rather small. Specimens when measured in one common phase were found to be about 80 μ long and 40 μ broad, being, however, in this phase almost uniform in breadth, and having only slightly rounded ends, but when creeping such specimens stretch out to a length of more than 90 μ. The animals move quickly, progressing often in a straight line and flowing with a motion somewhat like that of planarians; at other times thick, blunt, and—at first—hyaline pseudopodia may be extruded from one or more parts of the body. So far as has been observed, the animals appear to have a definite posterior end. The protoplasm is highly and coarsely granular, except at the periphery, and in some specimens ingested diatoms and other inclusions were to be seen. The contractile vacuole has not been made out definitely, but a stainable vesicle of constant size visible through a high power of a microscope in the anterior region of the living animal appears undoubtedly to be the nucleus. The absence of an easily visible nucleus and nucleolus makes it easy to distinguish the Amœbæ from the more or less amœboid forms of some sponge cells, which, moreover, are mostly spherical, and do not show anything like the active movement of the Amœbæ.

In their general characters these Amœbæ resemble the species described by Gruber (*Zeits. für Wiss. Zool.*, vol. xli., 1885, Leipzig, "Studien über Amöben," p. 219) as *Amoeba crystalligera*, but further investigations are necessary to establish their identity with that species.

J. H. ORTON.

The Laboratory, Plymouth.

A Remarkable Meteor on November 24.

LAST night, November 24, at 8.47 p.m., a very remarkable meteor was seen in the northern sky. It moved slowly in an east to west direction, describing a straight path of about 10° in length, which made a small angle (of some 20°) with the horizon, the eastern end being the lower, and remained visible for four or five seconds.

It presented a comet-like appearance, having a bright nucleus surrounded by a less intensely luminous envelope, which streamed out behind, forming a kind of double tail. Conspicuous blue (or green) flares were visible in the "tail," but the appearance lasted such a short time that I am unable to state exactly how they were distributed. It vanished as suddenly and as silently as it had flashed out.

The northern sky being overcast at the time, it was, of course, impossible to lay down its track relatively to the stars, but its position was referred to some tree-tops, which were silhouetted against the sky, and from observations made next morning I am able to state that the middle point of the apparent track was situated at an altitude of about 17° above the horizon, and at about 7° or 8° east of the north point.

Although seen through clouds which were sufficient to obscure all stars in its neighbourhood, including the conspicuous constellation of Ursa Major, the meteor appeared far more luminous than the planet Venus even at its brightest. In fact, with one exception, it was the brightest meteor I have ever seen. The one exception was the splendid daylight meteor of February 8, 1894, which appeared in full sunshine within a few minutes of noon, but was still bright enough to attract the attention of thousands of people at various places over an extended tract of country, from London to Whitby, and from Chelmsford, in Essex, to Ballinasloe, in the west of Ireland.

ARTHUR A. RAMBAUT.

Radcliffe Observatory, Oxford, November 25.

Darwinism 100 Years Ago.

IN reference to Dr. Gadow's interesting quotation from Tiedemann (NATURE, November 13), may I remind your readers that the principle of sexual selection was clearly enunciated by Erasmus Darwin in his "Zoonomia," first published in 1794? I quote from an edition of 1800. "A great want of one part of the animal world has consisted in the desire of the exclusive possession of the females; and these have acquired weapons to combat each other for this purpose. . . . So the horns of the stag are sharp to offend his adversary, but are branched for the purpose of parrying or receiving the thrusts of horns similar to his own, and have therefore been formed for the purpose of combating other stags for the exclusive possession of the females; who are observed, like the ladies in the times of chivalry, to attend the car of the victor. . . . The final cause of this contest amongst the males seems to be that the strongest and most active animal should propagate the species, which should thence become improved."

ARTHUR DENDY.

University of London, King's College, November 19.

Intra-atomic Charge.

IN a previous letter to NATURE (July 20, 1911, p. 78) the hypothesis was proposed that the atomic weight being equal to about twice the intra-atomic charge, "to each possible intra-atomic charge corresponds a possible element," or that (*Phys. Zeitschr.*, xiv., 1912, p. 39), "if all elements be arranged in order of increasing atomic weights, the number of each element in that series must be equal to its intra-atomic charge."

Charges being known only very roughly (probably correct to 20 per cent.), and the number of the last element Ur in the series not being equal even approximately to half its atomic weight, either the number of elements in Mendeléeff's system is not correct (that was supposed to be the case in the first letter), or the intra-atomic charge for the elements at the end of the series is much smaller than that deduced from experiment (about 100 for Au).

Now, according to Rutherford, the ratio of the scattering of α particles per atom divided by the square of the charge must be constant. Geiger and Marsden (*Phil. Mag.*, xxv., pp. 617 and 618, notes

1 and 2), putting the nuclear charge proportional to the atomic weight, found values, however, showing, not constancy, but systematic deviation from (mean values) 3·825 for Cu to 3·25 for Au. If now in these values the number M of the place each element occupies in Mendeléeff's series is taken instead of A, the atomic weight, we get a real constant (18·7±0·3); hence the hypothesis proposed holds good for Mendeléeff's series, but the nuclear charge is not equal to half the atomic weight. Should thus the mass of the atom consist for by far the greatest part of α particles, then the nucleus too must contain electrons to compensate this extra charge.

Table of the Ratio of the Scattering per Atom Divided by A^2 Compared with that Divided by M^2.

	I.	II.	Mean	Mean ×5·4	Mean $\times \frac{A^2}{M^2}$	M
Cu ...	3·7	3·95	3·825	20·6	18·5	29
Ag ...	3·6	3·4	3·5	18·9	18·4	47
Sn ...	3·3	3·4	3·35	18·1	19·0	50
Pt ...	3·2	3·4	3·3	17·8	18·6	82
Au ...	3·4	3·1	3·25	17·5	18·4	83
Mean ...	3·44	3·45	3·445	18·6	18·6	

A. VAN DER BROEK.

Gorssel, Holland, November 10.

The Stone Implements of the Tasmanians.

IN reply to Mr. J. P. Johnson's letter on Tasmanian stone implements in NATURE of November 13, attention may be directed to the paper read by M. Exsteens before the International Prehistoric Congress at Geneva last year, and destined to appear in vol. ii. of the *Compte-rendu*. It seems that the common opinion in Europe as to the culture represented by these relics of a recently extinct race was based principally on rejects from a large collection; and an inspection of the better worked specimens is sufficient to upset their eolithic origin in favour of a later stage, viz. Le Moustier-Aurignac, which is precisely Mr. Johnson's view. In 1906 the Rev. C. Wilkinson and Mr. Anthony presented a small but typical series of that character to the British Museum.

REGINALD A. SMITH.

Society of Antiquaries of London,
Burlington House, W., November 18.

Museum Glass.

IN connection with a work I am writing on "The History of Anatomy," I have been induced to trace the rise of the anatomical museum, and this appears to have depended to a larger extent than one would have suspected on the price of spirit and museum jars. In the second half of the eighteenth century John Hunter was using about 5000 museum jars for his spirit preparations. It would be interesting to learn whether these were made specially to his order, as I suspect, which firm he dealt with, and how much he was charged. Perhaps some old-established glass manufacturers can give me some isolated or continuous records of the prices of circular and rectangular glass jars used in museum work, and also the period when they were first manufactured in the ordinary course of business routine. From 1750 to 1850 is the period of most importance.

F. J. COLE.

University College, Reading, November 15.

CAPTAIN SCOTT'S LAST EXPEDITION.[1]

CAPTAIN SCOTT'S last journal has the deep interest of one of the most tragic documents in the history of exploration, for the fate of his party on its return from its magnificent and successful journey will surround his name with the romance that immortalises those of Franklin and of Burke and Wills. The human interest of Captain Scott's journals is greater than the geographical, for his route by the Beardmore Glacier was the same as that of Shackleton to one hundred miles from the Pole, and the remainder of the route was over a plateau with no special features of interest apart from its position. The reader therefore naturally hurries through the accounts of the voyage out, the landing on the middle of the western coast of Ross Island, the depôt laying in the first season, the happy life at the winter quarters, and the reports of enthusiastic scientific investigation by the staff. He will read with pleasure the eulogies of Dr. Wilson and the tributes to the capacity and enterprise of all the members of the expedition; and he may note, too, that Captain Scott started greatly preferring ponies to dogs, and that the old *Discovery* hut was used as an intermediate station on the way to the Barrier; the remarks that it was cold is not surprising, since half its heating apparatus had been left in New Zealand, and the insulating material on which its warmth depended was not inserted.

The Southern Party, with its various supporting parties, started between October 24 and November 3, with sledges drawn by motors, ponies, and dogs; and this part of the narrative inevitably recalls the old maxim against mixed transport. The transport was, however, gradually unified by the failure of the motors and the shooting of the ponies, the flesh of which was used as food, mainly for the dogs. After the fateful return of the dogs from the lower end of the Beardmore Glacier on December 12, the journey was continued with man-hauled sledges, with the aid of two supporting parties, which returned later. Eighteen miles from the Pole came the discovery of a camp and many dog tracks, followed by finding Amundsen's tent and letters, which have given conclusive evidence that both parties reached their goal.

The interest increases in the story of the return march, maintained with heroic persistence in spite of the ever-growing difficulties and weakness, which led to the final tragedy only eleven miles from the ample store of food and fuel at One Ton Depôt. There is no direct statement as to the real cause of the disaster. Dr. Wilson's diary may be expected to contain more explicit evidence; but though various extracts from Dr. Wilson's diary are quoted on comparatively unimportant details, there is none regarding the main problem. The

[1] "Scott's Last Expedition." In 2 vols. Vol. i., Being the Journals of Captain R. F. Scott, R.N., C.V.O. Pp. xxvi+633+plates. Vol. ii., Being the Reports of the Journeys and the Scientific Work undertaken by Dr. E. A. Wilson and the Surviving Members of the Expedition. Pp. xv+534+plates. Arranged by Leonard Huxley. With a Preface by Sir Clements R. Markham, K.C.B., F.R.S. (London: Smith, Elder and Co., 1913.) Price 42*s.* net.

gradual collapse of Evans with his shed finger nails, burst blisters, suppurating wounds, and mental lethargy, the swelling of the feet which gradually affected the whole party, and the few other symptoms stated, and those which may be read between the lines, all indicate scurvy as the cause of the gradual weakening of the party; and as the provisions had been cut down to a minimum, the slow progress rendered necessary the reduction of the daily rations. The fall which is said possibly to have injured Evans is apparently hypothetical, and would have happened so late in his illness that it would be an effect, and not a cause. The explanation that the party was finally stopped by a ten days' blizzard is inadequate, for though meteorological observations are not given for all the days between the arrival at the final camp and Capt. Scott's last entry, the weather to the north during part of the time is described as cold but fine; and though blizzards may be local, it seems most improbable that one should have lasted sufficiently long to have prevented the last march of eleven miles to One Ton Depôt, unless the men had been incapacitated by weakness.

Dr. Wilson's journals may contain more precise information, but from the general evidence in Captain Scott's, it appears probable that scurvy was responsible for the disaster. The last pages in the journal are ennobled by the magnificent courage with which the men awaited their slow but inexorable doom.

The second volume consists of the narratives of the subsidiary expeditions and preliminary statements of the scientific work accomplished, and thus calls here for longer notice. It would have been convenient if the names of the authors had been given in the list of contents. The volume opens with an account of the arduous journey by Dr. Wilson, Lieut. Bowers, and Mr. Cherry-Garrard in the mid-winter of 1911 to the Emperor Penguin rookery on the edge of the Barrier. This bird nests in the coldest season of the year, and as knowledge of its embryology might give very interesting results, an expedition was made to collect the young eggs. According to the opinion quoted in vol. ii., p. 77, Captain Scott considered this journey to have been the hardest which has ever been done. The temperature recorded of $-77°$ F. has only been exceeded in Siberia.

Photo.] FIG. 1.—Amundsen's tent at the South Pole. From "Scott's Last Expedition." [*Lieut. Bowers.*

The narrative of the Northern Party is given by Commander Campbell, who, with Dr. Levick, Mr. Priestley as geologist, and three men, were sent in the *Terra Nova* to reach King Edward Land, east of the Barrier. The steamer was unable to penetrate the pack ice, and according to the alternative instructions from Captain Scott, the

party was landed at Cape Adare at the winter quarters of the Southern Cross Expedition. It therefore became the Northern instead of the Eastern Party. Cape Adare proved an unsatisfactory base, as the effort to explore the coast to the west proved impossible owing to the unfavourable condition of the ice. The party was confined to a more detailed survey of Robertson Bay. In the following spring the six men were transferred to Terra Nova Bay for a summer's work in that district. The *Terra Nova* was unable to relieve them in the autumn, owing to the thickness of the pack ice, and, as they had been landed with only stores and equipment for the summer, they had to live through the winter on the resources of the country. Seals and penguins provided their food and fuel; they dug a dwelling house in a snowdrift, and after a winter of great privations they sledged down the coast to McMurdo Sound; they found a food cairn just in time, and were shortly afterwards rescued by the *Terra Nova*. It appears from Commander Campbell's narrative that they began the winter with very slight hope of living through it, and their survival reflects the highest credit on their courage, resource, and good comradeship.

The remaining narratives are the record of the ascent of Mt. Erebus by Mr. Priestley, of the last year's life at Cape Evans and the search for the Southern Party by Dr. Atkinson, and of the various voyages of the *Terra Nova* by Commanders Evans and Pennell.

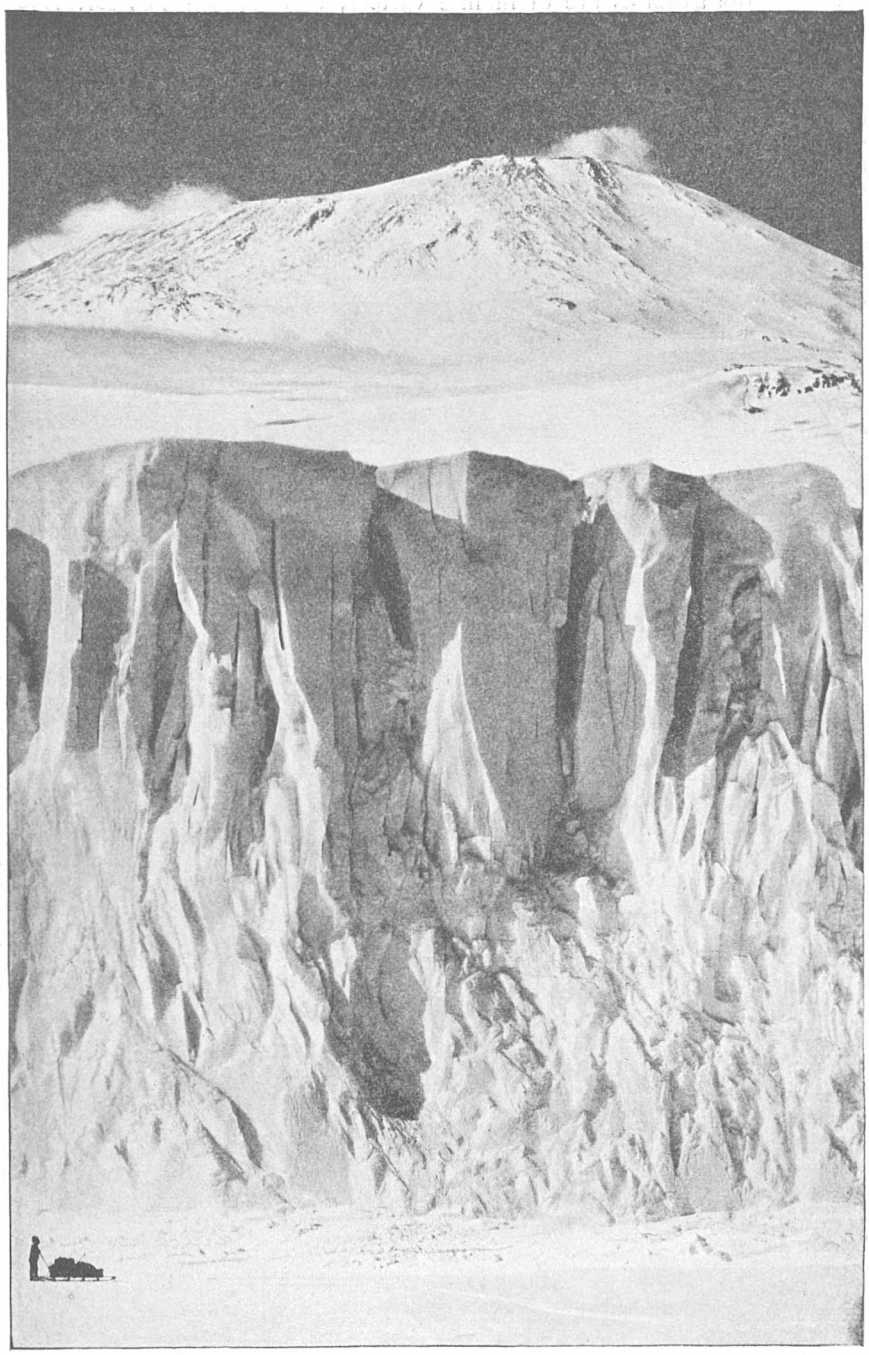


Photo.] FIG. 2.—The ramparts of Mount Erebus. From "Scott's Last Expedition." [*Mr. H. G. Ponting.*

The last section of the volume consists of general sketches of the scientific work undertaken during the expedition, but most of these are mainly statements of the work undertaken, for it is of course too early to know the results. They will obviously prove very important. Two of the most complete sections are those on the geological work on the mainland west of McMurdo Sound by Mr. Griffith Taylor and Mr. Debenham. Mr. Taylor reproduces an interesting diagram by Prof. David showing the striking resemblance in structure between the coast of South Victoria Land and the Pacific coast of Australia. The geological collections and observations have not yet been worked out, but sufficient is announced to show that very

important results were secured. According to the first accounts, this coast includes granites of two ages. Prof. David and Mr. Priestley, during the Shackleton Expedition, referred all the granites to one period; according to the present volume (p. 433), the granites are of infinite variety, and probably belong to many ages. The majority are assigned to the interval between Cambrian times and the deposition of the Beacon Sandstone; and perhaps the most important contribution that is promised by this expedition is the determination of the age of these sandstones owing to the discovery of some fossil plants, which are said to be much better than the indefinite remains collected by the two previous expeditions. The specific identification of the fossils is expected, and they are said to indicate a late Palæozoic age. Further details are given of the great dolerite sill intruded into the Beacon Sandstone, and from the description it appears to be strikingly like that which forms the most conspicuous feature on the central highlands of Tasmania. Some copper ore was found on the cliffs at Cape Bernacchi.

Mr. C. S. Wright describes the nature of his observations on the properties of ice, and briefly discusses the cause of the northward flow of the Barrier. It is now universally agreed that the Barrier is due to the accumulation of snow, as first suggested in NATURE, and as the ice is afloat close to its landward end, it can only flow northward; and if the snowfall is continuous across it the velocity is necessarily greatest along its northern edge. Mr. Wright has also described the magnetic, electrical, and pendulum observations, and the measurements of the radioactivity of the air.

The biologist, Mr. Lillie, has given a short summary of the zoological work, and as fifteen rich trawl hauls were made, many new species may be expected. He remarks, however, while though there is an extraordinary wealth of individuals, the variety of forms is not very great, whereas the one Antarctic haul of the *Challenger* contained the highest proportion of new forms. But Mr. Lillie's result is what would have been expected, especially in the shallower waters.

The meteorological report by Dr. Simpson, though he says it will take years to work out the full results, contains some interesting suggestions. One passage illustrates the malicious irony of fate. He points out "one can now say definitely that the blizzards which have been so fateful to British Antarctic exploration are local winds confined to the western half of the Ross Barrier" (vol. ii., p. 463). He adds: "If this had been known previously, the history of the conquest of the South Pole would have been very different." Dr. Simpson was originally selected as the physicist for the expedition of the *Discovery*, but he was rejected on the grounds of health by the naval medical authorities. If he had gone on that expedition its observations on its chief meteorological problem would not have been set aside as unintelligible, and his conclusion would no doubt have then been so clearly recognised that the great Antarctic tragedy might never have occurred.

Both volumes are superbly illustrated by photographs by Mr. Ponting, including one in natural colours, and by coloured plates after the beautiful sketches by Dr. Wilson. J. W. G.

RADIUM RESOURCES.

AN address to the sixteenth annual convention of the American Mining Congress, Philadelphia, October 20–24, by Mr. C. L. Parsons, of the Division of Mineral Technology, Bureau of Mines, is published in *Science* of October 31, dealing with the present commercial situation as regards radium and its ores, the available sources of radium in America and elsewhere, the prospecting for, concentration, and costs of mining carnotite, and the probable future of radium in the treatment of disease. A bulletin is about to be issued by the Bureau of Mines, and an advance statement was issued in April directing attention to the fact that in 1912 nearly three times as much radium in the form of carnotite deposits was produced from Colorado as from all the rest of the world put together, and was exported almost entirely to Europe.

The publication of this statement has already resulted in a considerable increase in the selling price of the material, and has rendered ores containing less than 2 per cent. of uranium oxide saleable, whereas before they were worthless. American carnotite is found in several districts in Colorado (Montrose and San Miguel counties), the Paradox Valley being described as the richest known radium-bearing region of the world, and in Utah, north-west of these counties, the deposits of which are of lower grade, but cost less in transportation than those of Colorado. In the latter case (Paradox Valley) mining costs 28 dollars to 40 dollars, and hauling charges to the railway 18 dollars to 20 dollars. The costs in the European markets average 70 dollars, and a 2 per cent. ore at Hamburg now sells at 95 dollars per ton. Mechanical concentration has been successfully employed, and it appears can save at least one-half of the material now wasted.

The equilibrium amount of radium (element) in a 2 per cent. U_3O_8 ore is about 5·25 milligrams per ton. The actual amount present in carnotite may safely be reckoned to be at least 4 mg., which, when extracted, sells for about 100*l.* Of this sum 20*l.* represents cost of raw material, leaving 80*l.* per ton margin for the cost of extraction and profits of the manufacturer and salesman.

Efforts are being made to foster the production of radium in the U.S.A., for although the total value of the world's output is insignificant, compared with that of commoner materials, being estimated for 1912 as 1,000,000 dollars, its potentialities in work for the public knowledge and public weal cannot be measured in cash. A National Radium Institute has been formed, working in conjunction with the Bureau of Mines, for

the performance of experiments and publication of results in concentration of carnotite ores, reduction of present wastage, and the extraction of sufficient radium for extensive trial in the treatment of cancer.

From a point of view nearer home, it is clear that, as in the case of the Austrian deposits, so also everywhere where radium is found, the question of its supply will be regarded more and more as of national importance, and a nation trusting to the equitable operation of the laws of supply and demand is likely to be squeezed out. The situation for this country is a sufficiently serious one. Nothing is more certain than that, if radium is to be of use in the treatment of cancer, small quantities are not merely worthless, but may even do harm rather than good. Grams of radium in each large centre of population, kept in operation every minute of the twenty-four hours, alone will meet the impending development. Whence is it to be obtained? Austria and America have the radium, Germany the mesothorium raw material. A future source of supply for this country is a question of national concern, though we have not, like the Bureau of Mines in America, a ministerial department likely to move in the matter spontaneously. In the public interest the matter should be lifted once for all above the plane of private venture and financial speculation. Will not the Institution of Mining and Metallurgy fulfil this public duty in lieu of a Bureau of Mines, and appoint an expert committee, mainly of practical mining authorities, but with representatives of technical chemistry and medicine, to consider the situation and take energetic steps to meet it?

FREDERICK SODDY.

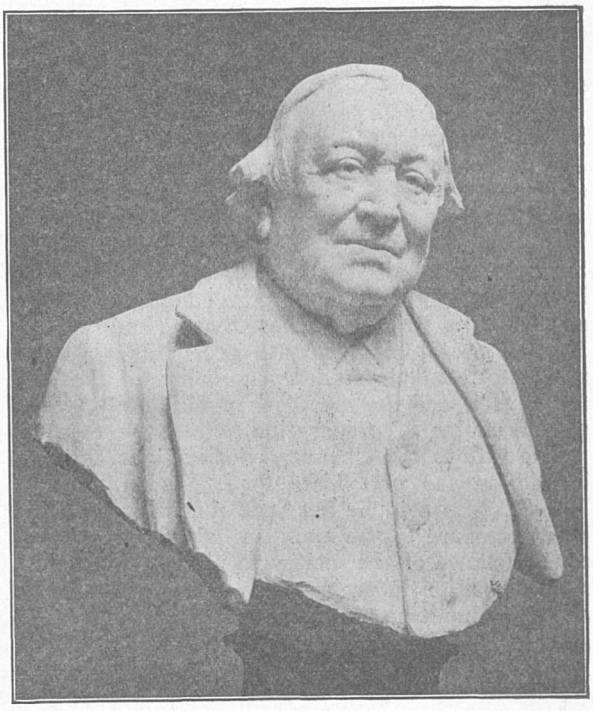
PRESENTATION OF THE BUST OF SIR HENRY ROSCOE TO THE CHEMICAL SOCIETY.

THE former students of the Right Hon. Sir Henry Roscoe decided some time back to commemorate the celebration of his eightieth birthday in January, 1913, by presenting his bust to the Chemical Society of London. With this object in view a committee was formed, of which Sir Edward Thorpe has acted as chairman, and on which many prominent chemists who were students of Sir Henry's during the long period he occupied the Chair of Chemistry at Owens College, now the University, Manchester, were associated. The formal presentation of the bust, a photograph of which is here reproduced, was made at the Rooms of the Chemical Society on Thursday last, November 20.

Among those present, in addition to Sir Henry Roscoe, were Miss Roscoe, Mr. and Mrs. Mallet, Mrs. Edward Enfield, Mr. E. W. Enfield, Sir Edward Thorpe, Sir Archibald Geikie (president of the Royal Society), Prof. W. H. Perkin (president of the Chemical Society), Prof. H. E. Armstrong, Prof. H. B. Dixon, Prof. P. F. Frankland, Dr. Hugo Müller, Prof. W. Odling, Prof. Emerson Reynolds, Sir William Tilden, Sir Thomas and Lady Barlow, Sir J. Rose Bradford and Lady Bradford, Sir Henry Miers, Dr. Aubrey Strahan (president of the Geological Society) and Mrs. Strahan, Mr. Harry Baker, Mr. E. J. Bevan, Dr. Horace T. Brown, Dr. J. C. Cain, Dr. H. G. Colman, Prof. A. W. Crossley, Dr. J. Kent Crow, Dr. Dobbie, Mr. J. M. Fletcher, Prof. Harden, Mr. A. J. King, Dr. C. J. Martin, Dr. Rudolph Messel, Dr. E. J. Mills, Mr. Pattison Muir, Dr. J. C. Philip, Mr. Rupert Potter, Prof. Schuster, Dr. Alexander Scott, Mr. Evelyn Shaw, Dr. S. Smiles, Mr. Watson Smith, Dr. A. Smith Woodward, and Dr. Charles A. Keane (secretary to the committee).

Sir Edward Thorpe first presented to Sir Henry Roscoe the following address from his former students, which had been given him in a preliminary form on the actual day of his birthday, and to which the signatures of those associated with the commemoration had now been added.

On April 22, 1904, the jubilee of your doctorate of Heidelberg University, it was the privilege of 300 of your friends and pupils to express to you their



Bust of the Right Hon. Sir Henry Roscoe.

appreciation of your services to chemical science, and especially their gratitude to you for your stimulating influence as their teacher, and for your personal interest in their progress and welfare which has endeared you so lastingly to one and all.

To-day, on the attainment of your eightieth birthday, we gladly welcome a further opportunity of recording our continued appreciation of your long life and work. We extend to you our most sincere and heartfelt congratulations, and rejoice to know that you have been granted health and strength thus to prolong your successful labours and activities, and to add to the large debt of thanks that is your due from your pupils, your science, and your country.

Although it is now twenty-seven years since you resigned the chair of chemistry at Owens College, your influence as our teacher and friend has continued with us. Amongst your former pupils there are many who, thanks to the teaching they received at your hands, have been enabled to contribute to the advancement of science, and who in their turn, both in

academic work and in industry have been privileged to train a second generation of men—your chemical grandchildren—whose labours it is hoped may add further testimony to the inestimable value of your guidance and example.

As a permanent tribute of our gratitude and affection towards you and in grateful remembrance of all your kindnesses and encouragement to us, we desire, on this occasion, to present your bust to the Chemical Society of London. We trust this proposal will commend itself to you, and that it will be some pleasure to you and your children to know that such an association with the representative Chemical Society of this country will be established for all time.

We sincerely wish that you may be spared to enjoy further years of good health, happiness, and activity.

The address had been signed by about 140 of Sir Henry's former students, many of whom now occupy responsible positions both in academic work and in association with chemical industries, and are to-day distributed not only in all parts of the United Kingdom, but also in Germany, Russia, Canada, the United States of America, Australia, South Africa, and Japan.

Sir Edward Thorpe then unveiled the bust of Sir Henry Roscoe, and on behalf of the subscribers asked the president of the Chemical Society to accept it as a permanent memento from Sir Henry's former students of his lifelong association with, and interest in, the welfare of the society. Sir Edward also extended to Mr. Albert Drury, R.A., the thanks of the committee for the excellent and striking likeness that he had secured. He also asked Sir Henry to accept as a further memento from his students a replica of the bust for himself and the members of his family, which was in course of preparation.

The gift to the Chemical Society was acknowledged by the president, Prof. W. H. Perkin, F.R.S., who said he felt sure that it would be a great pleasure to the members of the council and to the fellows of the society to place the bust in a fitting position in their rooms, where they would always value it as a token of the great admiration and affection they all had for Sir Henry Roscoe. He also expressed to Sir Henry Roscoe the appreciation of the fellows of the society for his continued interest in the society, and for the valuable donations that he had given them, especially in connection with their library.

Sir Henry Roscoe, in acknowledging the gifts both to himself personally and to the Chemical Society, expressed the great pleasure that it gave him to be present, and to say how deeply touched he was by this renewed expression of esteem and affection thus shown to him by his old pupils.

"No honours, no rewards, can, I think," he said, "compare with this, and to these men, whom I like to look upon as my scientific sons, come my heartfelt thanks. To their kindness rather than to my own deserts is this fresh recognition due, for looking back over my fourscore years of life, I see how small the deeds, great though the will may have been. To you, Sir Edward Thorpe, as chairman of the committee, as well as to Dr. Charles Keane, the secretary, and to the other members of the committee, my special thanks are due. I thank the Chemical Society through you, Mr. President, for the great honour it has done me by placing my effigy in its library. I cannot flatter myself that the coming generation of fellows of the Chemical Society will look upon my face with the veneration with which they will gaze on the features of the great masters whose busts adorn your walls, but if the sight of this one recalls to their memory that this was a man who loved his science, his teaching, and his students, and if that sight helps to imbue them with a like love, then perhaps my bust in your library may be of some use. Now, my friends, I thank you all, and wish you all God-speed."

NOTES.

We regret greatly to announce that Sir Robert S. Ball, F.R.S., Lowndean professor of astronomy and geometry in the University of Cambridge, and director of the Cambridge Observatory, died on Tuesday, November 25, at seventy-three years of age.

The Home Secretary has appointed a Committee to inquire what action has been taken under the Wild Birds Protection Acts for the protection of wild birds, and to consider whether any amendments of the law or improvements in its administration are required. The members of the Committee are:—The Hon. E. S. Montagu, M.P., Under-Secretary of State for India (chairman); Lord Lucas, Parliamentary Secretary to the Board of Agriculture; Mr. Frank Elliott, of the Home Office; Mr. E. G. B. Meade-Waldo, Mr. W. R. Ogilvie Grant, and Mr. Hugh S. Gladstone. The secretary to the Committee is Mr. H. R. Scott, of the Home Office, to whom any communications on the subject of the inquiry may be made.

The death is announced, at fifty-one years of age, of Mr. H. F. B. Lynch, well known by his extensive travels in the Middle East for purposes of scientific, political, and commercial research.

An exhibition of one hundred and forty of the remarkable series of photographs, greatly enlarged, taken by Mr. H. G. Ponting during the British Antarctic Expedition of 1910–13, will be opened on Wednesday next, December 3, at the Fine Art Society, 148 New Bond Street, London, W.

The death is announced, in his fortieth year, of Dr. Ora W. Knight, who had been consulting chemist and assayer to the State of Maine since 1903. He had previously been assistant chemist at the Maine experiment station for several years. Dr. Knight was known as an ornithologist and a botanist; he was the author of a standard book on the birds of Maine, and his herbarium contained a nearly complete collection of the plants of that State.

The death is announced of the veteran Italian geologist, Prof. Igino Cocchi, of Florence. He was born in 1828, and was one of the most active pioneers in stratigraphical geology in Italy. In 1867 he became the first president of the committee directing the Geological Survey of Italy, which he had been mainly instrumental in founding. Some of his studies were made in England, and he was elected a foreign correspondent of the Geological Society of London in 1874.

The Smithsonian Institution announces the following changes in the *personnel* of the department of

geology, United States National Museum:—Dr. E. T. Wherry, late assistant professor of mineralogy at Lehigh University, has been appointed assistant curator of mineralogy and petrology in succession to Mr. Joseph E. Pogue, transferred to the United States Geological Survey; Dr. J. C. Martin has been appointed assistant curator of physical and chemical geology in succession to Mr. C. G. Gilbert, appointed curator of mineral technology.

A MEETING of the council of the Zoological Society of Scotland has just been held, at which a very satisfactory report was made on the working of the Zoological Park for the period during which it has been open. Since the end of July, when the park was opened to the public, 102,233 visitors have entered, while the receipts at the gate for the three and a half months have resulted in a surplus of about 1000*l.*, after paying the expenses of upkeep for five months. The number of specimens received during the period was 420; the health of the stock is excellent, and the death-rate has been very light. Twenty new fellows were admitted, and the number of fellows on the roll now exceeds 2000.

WE are glad to see that the scale of charges for the services of the official guide appointed a short time ago to conduct parties of visitors round the collections contained in the garden, plant-houses, and museums of the Royal Botanic Gardens, Kew, and to point out objects of particular botanical interest, has been greatly reduced. Hitherto the scale of charges has been 2*s.* 6*d.* for each person attending a morning tour, and 1*s.* for each person attending an afternoon tour, but in future these charges are to be 6*d.* and 3*d.* respectively. These charges are so low that no one need now be deterred from participating in the instructive tours around the gardens taken by the guide daily.

DR. H. BAYON, research bacteriologist to the Union Government of South Africa, gave a lecture at the Royal Society of Medicine on November 20, on the leprosy problem in the British Empire. He pointed out that the latest returns showed that in India the leper population had increased from 100,000 to 110,000. Dealing first with treatment, Dr. Bayon stated that in selected cases a vaccine prepared with certain cultures had given promising results. He finally urged that it is the duty of every Government to prevent the further spread of leprosy by the use of all the means of preventive medicine, and, in particular, by the institution of a system of universal segregation of all lepers.

IN connection with a suggested removal of the statue of Charles I. at Charing Cross, *The Field* of November 15 directs attention to the interest attaching to the "great horse" on which the King is mounted. These "great horses," one of which is represented in a picture by Vandyke in Buckingham Palace, executed from an animal in the Royal stables, "were the direct descendants of the Italian horses Altobello and Governatore . . . sent over to the stud at Hampton Court by the Marquis of Mantua as a present to King Henry VIII., and the breed was still further improved by the two splendid Spanish horses sent to King Edward VI. by Charles V. in 1552, which were of the type shown in the well-known sketches by Rubens."

PARTICULARS of the Pierre J. and Edouard Van Beneden prize of 2800 francs are given in the Bulletin of the Royal Academy of Belgium (Classe des Sciences, 1913, No. 7). The prize is to be awarded every three years to the Belgian or foreign author or authors of the best original work of embryology or cytology written or published during the three years preceding the date on which competing theses must be received. For the first competition this date is December 31, 1915. The manuscript works may be signed or anonymous, and the French, German, or English language may be employed. Authors should send their contributions, duly stamped, to the permanent secretary of the Academy, Palais des Académies, Brussels, inscribed "Concours pour le Prix Pierre-J. et Edouard Van Beneden."

THANKS largely to the kindness of the Percy Sladen Trust, an expedition left Perth, West Australia, a few days ago, for the Abrolhos Islands. The group is situated about forty miles out in the Indian Ocean from the coast of Western Australia, and roughly 300 miles north of Perth. The expedition has been organised by Prof. W. J. Dakin, of the new University of Western Australia, and accompanying him is Mr. W. B. Alexander, of the Perth Museum. From many points of view this little group of islands is of great interest. The wreck of the Dutch East India Co.'s ship, *The Batavia*, under the command of Capt. Pelsart, in 1629, is said to have led to the first recorded discovery of Australia. Whether true or no, the mutiny of part of the wrecked crew and the story of their final capture is worthy of any fiction. Plutonic rocks occur in one of the island groups, but the others are coral formations. It is said that not only does the terrestrial fauna bear interesting relations to the mainland, but that the intervening forty miles of sea separate two totally distinct marine faunas. Whilst the coastal fauna at this latitude is temperate, the island marine fauna is understood to be tropical. The members of the expedition intend making a close investigation of the fauna and flora of the islands and surrounding reefs. The material collected will be reported upon in the usual way by specialists.

DR. ANTON FRITSCH, director of the natural history departments of the Royal Bohemian Museum, and for many years professor of zoology in the Royal Bohemian University, died after a brief illness at Prague on November 15, aged eighty-one. Dr. Fritsch's first published work (1851) was a list of the Bohemian, German, and Latin names of the birds found in Bohemia; and throughout his life he took the deepest interest in the local fauna, making many contributions to knowledge, especially of the birds and fishes. In 1891 he founded a small station for the special study of the fresh-water fauna of the Bohemian lakes. Dr. Fritsch will be best remembered, however, by his numerous researches on the fossils of the Permian and Cretaceous formations of Bohemia, the results of which were published in several volumes. His "Fauna der Gaskohle" (1879–1901) will always remain

a standard work of reference on the early Labyrinthodont Amphibia, and it forms a monument to his patient industry. Most of the fossils described were pyritised and unfit for study and preservation in the ordinary manner. Dr. Fritsch therefore cleaned away all the petrified material, leaving only the casts in the shale, from which he took clear impressions by an electrotype process. He was thus able to make good use of specimens which at first sight appeared of little value. His enthusiasm made him an inspiring teacher, and he has left several pupils who are diligently prosecuting the researches he suggested to them. Dr. Fritsch was a foreign member of the Geological Society of London, from which he received the Lyell medal in 1902.

NATURAL philosophy in general and palæontology in particular have lost an ardent disciple and a zealous worker by the death of Henry Potonié at Berlin on October 28. He was born November 16, 1857, in Berlin, where from 1878–81 he studied botany, becoming in 1880 assistant in the Botanic Garden, and scientific "Hilfsarbeiter" in the museum. His association with the garden is marked by a descriptive account of the plant-geographical arrangement of its contents by Prof. Engler, which Potonié published in 1890. A more important botanical work was the "Illustrated Flora of North and Central Germany," issued in 1885, and subsequently in several enlarged editions. In 1885 Potonié became associated with the Prussian Geological Survey, and from that time onwards palæobotany claimed the greater share of his activities. In 1887 he published a comparative anatomical study of recent Pteridophytes and of *Cycas revoluta*, with the view of the determination of the fossil species of the older formations. This was the first of a long series of important papers bearing on fossil botany published by the Geological Survey. In 1891 he became professor of palæobotany at the School of Mines (Bergakademie), and in 1897–9 appeared the well-known text-book, "Lehrbuch der Pflanzenpalæontologie," on a new edition of which he was working immediately before his last illness. His valuable work, "On the Origin of Coal and other Combustible Minerals," is based on a course of his lectures. In 1901 he was appointed "Landesgeologe," and also joined the teaching staff of the University. He was the founder of the *Naturwissenschaftliche Wochenschrift*, with which he was associated for twenty-four years, and of which he was editor at the time of his death; a recent number has a short appreciation and good portrait. During his last illness he received the honour of Geheim-Bergrat.

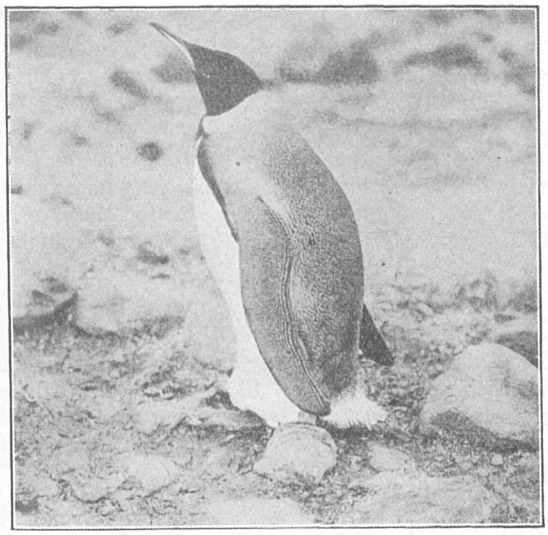
THE October issue of *The National Geographic Magazine* is largely devoted to an article, illustrated by a fine collection of photographs, of a journey by Mr. G. Kennan through the eastern portion of the province of Daghistan, in the south-eastern corner of European Russia, between the Black Sea and the Caspian. He describes the splendid mountain scenery, the result of the intrusion of igneous rocks on the sedimentary strata, the whole worn down and torn into precipitous ravines by subsequent denudation. The population is of the most varied character —Aryan, Arab, Tartar, Crusader, and refugees from the adjoining regions have left their mark. Many individuals, if dressed in the costume of western Europe, would certainly be taken for Englishmen, Scotchmen, Bavarians, or Saxons. The homes often assume the character of the pueblos or cliff-dwellings of New Mexico. The peoples speak some thirty languages, with numerous dialects. The prevailing religion is Islam. Many archaic customs and a primitive tribal organisation survive, but Russian domination and the extension of education tend to promote the growth of uniformity.

CAPTAIN H. G. LYONS brought the subject of relief in cartography before the research meeting of the Royal Geographical Society on November 20, indicating that British contributions to this important branch of cartography are not numerous. He discussed the relative value of contours, hachures and coloured shading, and their utility as measured by their applicability to different kinds of map. He summarised the limits of scale within which each method best serves its purpose, and showed reasons why, outside these limits, one method or another fails to fulfil its function properly. Such a summary should form a valuable guide to cartographers, although when the author stated that hachuring becomes "conventional" on a scale smaller than about 1 : 500,000, because this this scale so compresses ridge and valley in mountainous regions, he might have been taken to task by the artist of such a map as the Swiss sheets in "Stieler" (1 : 925,000), who might have suggested that convention is to be distinguished from careful generalisation. The author also brought out the limitations of contour systems in portraying gently undulating ground—a point which the student often has need to remember. He dealt at length with various systems of colouring used in conjunction with contours, and discussed the basis of "physiological optics," on which the selection of colours for this purpose ought to rest.

DR. AND MRS. WORKMAN gave the Royal Geographical Society, at its meeting on Monday, November 24, an account of their further explorations, conducted last year, among the Karakoram Himalayas. Their objective on this occasion was the Siachen or Rose Glacier. Mrs. Workman indicated the course of their journey, and gave an account of their additions to the map of the region, incidentally controverting the views of previous visitors on several points. The surveyor who accompanied the party was Mr. C. Grant Peterkin. To the pass at the head of the Bilaphond Glacier Mrs. Workman applies the name of the glacier itself, and not that of Saltoro. attached to it as "traditional" by Dr. Longstaff. She dealt with the same explorer's high peak of Teram Kangri, which he gave as 27,610 ft. high, while Mr. Peterkin made it only 24,560 ft. She observed for the first time a group of lofty peaks behind the east Siachen wall, on the Turkestan side, which form additions to the map, and others from the Silver Throne plateau, to the highest of which (24,350 ft.) the name of Queen Mary was given. The possibility of the Siachen glacier having provided an

old route into Chinese Turkestan was considered and dismissed, in spite of the discovery of remains of rude buildings at high altitudes. Dr. Workman dealt in detail with the geology of the region and the character and work of the glaciers; his paper was perhaps of most notable interest in the paragraphs which described the junction of "probably the largest existing valley tributary outside the polar regions . . . with the largest known valley glacier." These are the Tarim Shehr (two miles wide) and the Siachen, which is $2\frac{3}{4}$ miles wide just above the junction. The two are compressed into the width of the main valley below the junction.

To the October number of the American Museum Journal Mr. R. C. Murphy communicates a graphic and richly illustrated account of his experiences among the petrels, penguins, and sea-elephants of South Georgia during a visit to that desolate island undertaken on behalf of the museum and the Brooklyn Institute, much interesting information being also given with regard to the eight whaling stations on the island. One of the most interesting photographs



A king-penguin incubating its egg.

(here reproduced) shows a king-penguin incubating its single egg, which is supported on the instep, where it is covered by a fold of the skin on the under surface of the body, the bird standing all the time in the upright posture, and the two sexes relieving one another in the duties of incubation. Although the whales are stated not to show at present serious signs of diminution in number, in spite of the rapid rate at which they are being killed off, the prospects of the sea-elephants appear deplorable. "Slow, unsuspicious, gregarious, they can be hunted profitably until the last one has gone to his ancestors, and the calamity of the Antarctic fur-seal is repeated." The fate of these gigantic seals depends, then, it would seem, on the results of the investigation now being conducted on behalf of the Colonial Office.

IN *The American Naturalist* for October (vol. xlvi., p. 577) Dr. R. Pearl discusses the measurement of the intensity of inbreeding. He points out the principles which must govern such an attempt, and shows that it is possible to find a coefficient by which the amount of inbreeding can be represented, so that different cases can be compared. The coefficient is based on the ratio of the actual to the possible number of ancestors in any generation, and therefore indicates the amount of inbreeding for a given number of generations back. The latter part of the paper discusses the differences between close inbreeding in bisexual reproduction and self-fertilisation of hermaphrodites, and shows that in some important respects the two are not comparable. An abstract, with some new material, is published in Bull. 215, Maine Agricultural Experiment Station.

A CRITICAL study of the conditions connected with the preparation of plantation para rubber has been made by Mr. B. J. Eaton, and the results of the inquiry are presented in Bulletin No. 17 of the Department of Agriculture, Federated Malay States. The endeavour of the author has been to collect as much trustworthy information as possible on the quality of rubber prepared by different methods and under different conditions so that such knowledge can be applied in indicating the causes underlying defects of rubber samples coming on the market. The effect of various coagulants and of dilution of the latex, period of coagulation, inhibitive substances, metal salts, light, and of micro-organisms on the quality of the rubber is dealt with at length. The use of sodium bisulphite as a means of inhibiting the action of oxidases and to ensure the production of light-coloured rubber has been found to be effective and profitable.

IN the current *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, A. Granger gives an interesting outline of the rise and fall of the manufacture of *porcelaine tendre*, usually called "fritted" or "soft" porcelain. It seems to have been first made in Rouen, about 1673. The body of soft porcelain in its best days appears to have been made from an artificial glass (frit) mixed with a marl from Argenteuil; and after the body was fired it was covered with a plumbiferous glaze. This ware lent itself to particularly pleasing decorative effects, and the Sèvres factory made this variety of porcelain famous. The "narrow margin of safety" in manufacture led to a particularly large percentage loss. Possibly owing to changes in the character of the raw materials, &c., the losses finally became so great that the manufacture had to be abandoned, and soft porcelain was ousted by the regular type of "continental porcelain"—the so called *porcelaine dure*, or "hard" porcelain. The body of this type of ware is made from a mixture of felspar, clay, and quartz, and glazed with a felspathic glaze. Unlike soft porcelain, the glaze and body of hard porcelain are fired in one operation. Mr. Granger gives some old recipes and describes some interesting recent attempts to revive the manufacture of soft porcelain at Sèvres.

WE have received several further letters from Mr. S. L. Walkden complaining about the statement in our review of his "Aëroplanes in Gusts," which was corrected by him in his letter to NATURE of October 30. In reference to this matter the reviewer writes:—"I

should have thought that Mr. Walkden's letter, together with my lengthy quotation from his book, would have been more than sufficient to remove any injustice that might have arisen through a statement of claim being made in the reviewer's and not the author's words. At the same time, it is necessary to warn readers that the amended claim contained in Mr. Walkden's letter must be read in conjunction with the lengthy quotation in NATURE, or better with the contents of the book itself, otherwise a false idea may be formed of the author's treatment. The only accelerations which the air can be said to *impress* on an aëroplane in the recognised Newtonian meaning of the term, are those due to the pressures of the air on its supporting surfaces, and are measured by the accelerations which the aëroplane would undergo if no other forces acted on it, their direction being in the direction of the corresponding impressed forces. In these circumstances a gust having a downward *velocity* would impress a downward, not an upward, acceleration on the aëroplane. It will be seen that the quotations from his book in my letter contain no reference to accelerations *impressed* by air pressures on the plane in this sense, and, *while I am quite willing to accept the author's amended statement of his claims,* I should not feel justified in stating these claims in this form without his written authority."

SIX years ago Prof. O. Knoblauch, of the Technical High School at Munich, determined the specific heat of superheated steam, at constant pressures, for temperatures up to 662° F., and pressures up to 124 lb. per sq. in. These experiments were conducted on a scale which directly appeals to the engineer, and the results, which Prof. Knoblauch obtained in conjunction with Dr. Max Jakob, are accepted largely by engineers. *Engineering* for November 7 contains an account, with drawings of the apparatus employed, of further experiments by the same investigators. Knoblauch has extended the range to 1020° F., up to pressures of 114 lb. per sq. in., and the experiments are being continued at higher pressures up to twenty atmospheres. Jakob has attempted to check the results by calculating the specific volume of steam, for the same high range of pressures and temperatures, from the experiments of Knoblauch and his collaborators, and also from the deductions of H. N. Davis, and by comparing these volume results with those directly determined. The research shows that the specific volume can be calculated from the specific heat, and the experimental values for the specific heat are thus confirmed. The general result is that the specific heat of steam at constant pressure increases with pressure, especially near the saturation line, though much less so, and scarcely at all finally, as the degree of superheating is raised. As the temperature rises, the specific heat, c_p, decreases to a minimum, to increase again slightly.

THE Cambridge University Press has recently made further additions to the "Cambridge Manuals of Science and Literature." The series now numbers eighty volumes, and its general excellence, to which attention has been directed on former occasions, is well maintained by the half-dozen books which have just been received. Three of the new volumes deal with biological subjects. Prof. G. H. Carpenter tells "The Life-Story of Insects," and provides an outline sketch of the facts and meaning of insect transformations. Prof. W. J. Dakin, in his little book on "Pearls," give a summary of the most important facts about pearls, pearl fishing, and pearl formation. The third biological topic is handled by Mr. H. Russell, who writes on "The Flea," and his book, which is, he thinks, the first in English devoted wholly to the subject, will prove particularly useful now that it is known that fleas are the active agents in spreading plague. Dr. E. J. Russell contributes a book on "The Fertility of the Soil," which is addressed to all who are keenly interested in the soil they are cultivating and want to know something more about it. Prof. A. H. Gibson, under the title, "Natural Sources of Energy," discusses the problem of forecasting the conditions of life and activity in future centuries. The sixth book, on "The Peoples of India," is by Mr. J. D. Anderson, who gives a popular account of the race and caste, the languages, and the religions of the various peoples in our Indian Empire.

MR. REGINALD CORY has received permission of the King to dedicate to his Majesty the volume, entitled "The Horticultural Record," which is to be published next month by Messrs. J. and A. Churchill. The work will contain numerous plates, coloured and half-tone, reproduced from photographs taken at the Royal International Horticultural Exhibition, 1912. Several well-known writers contribute articles on the progress of horticulture since the first international exhibition in 1866.

MESSRS. LONGMANS, GREEN AND CO. have in preparation "Chemistry of the Radio-Elements, Part ii., The Radio-Elements and the Periodic Law," by Mr. Frederick Soddy, F.R.S. This is an extension of the original monograph, and covers recent generalisations connecting the radio-active disintegration series with Mendeléeff's table.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR DECEMBER :—

Dec.	1.	22h. 1m. Uranus in conjunction with the Moon (Uranus 3° 9′ N.).
	2.	3h. 0m. Mercury stationary.
	,,	8h. 5m. Mercury in conjunction with Venus (Mercury 1° 34′ N.).
	6.	21h. 0m. Saturn at opposition to the Sun.
	10.	12h. 0m. Mercury at greatest elongation W. of the Sun.
	12.	15h. 58m. Saturn in conjunction with the Moon (Saturn 6° 45′ S.).
	15.	9h. 57m. Mars in conjunction with the Moon (Mars 0° 59′ S.).
	,,	18h. 36m. Neptune in conjunction with the Moon (Neptune 4° 29′ S.).
	20.	9h. 44m. Variable star, Algol, at minimum.
	21.	22h. 35m. Sun enters sign of Capricornus. Solstice.
	23.	6h. 33m. Variable star, Algol, at minimum.
	25.	20h. 23m. Mercury in conjunction with the Moon (Mercury 5° 26′ N.).

26. 5h. 57m. Venus in conjunction with the Moon (Venus 5° 13′ N.).
28. 12h. 32m. Jupiter in conjunction with the Moon (Jupiter 3° 46′ N.).
29. 9h. 45m. Uranus in conjunction with the Moon (Uranus 2° 53′ N.).

A NEW HILL ASTRONOMICAL OBSERVATORY.—M. H. Perrotin, writing in the *Revue Générale des Sciences* (November 15, No. 21), records the foundation of a new hill observatory on Mont Salève, at an elevation of 1250 metres. This new observatory owes its origin to the fact that M. Schaer, of the Geneva Observatory, having completed the construction of a Cassegrain telescope of 100 cm. in diameter, looked for a suitable spot in the canton of Geneva where an observatory could be built in order to make the best use of this telescope. The plain of Geneva, bounded by the Jura, the Salève, and the lake, was always found to be invaded by the mist during the fine season and by fog in winter. Such bad observing conditions are nearly always associated with low-lying stations, and hence the general tendency of either moving old or creating new observatories on elevated sites removed from large rivers, lakes, and towns. M. Schaer's work has always been encouraged by M. Honegger, and it is due to the latter that this high site can be utilised. The observatory will be used both for astronomy and meteorology, and the chief astrophysical work will be the study of the spectra of the stars of the second and third magnitude with very great dispersion. An astrophysical laboratory will be attached, and an electric current of 500 volts will be available; spectroheliographic work will also be done. M. Schaer invites French astronomers or meteorologists to make use of the site either by using the observatory's instruments or any instruments they may like to bring with them.

MEASUREMENT OF RADIAL VELOCITIES BY OBJECTIVE GRATING SPECTROGRAPH.—The determination of the velocities in the line of sight of the fainter stars is becoming an urgent necessity in astrophysics, and consequently efforts are being made to replace the slit spectrograph by other arrangements capable of utilising a greater proportion of the light available. To this end M. Maurice Hamy explains in a note in No. 17, *Comptes rendus*, a method by which an objective grating spectrograph may be employed for this purpose. The grating, preferably one giving under normal incidence only two symmetrical spectra, must be mounted so that these spectra may be photographed in two separate cameras. A collimator fixed to the same base is used to furnish comparison spectra from a terrestrial light-source. To eliminate the effects of variations of the angle of incidence the exposures on the star and comparison have to be intermittent and alternate. The reduction is based on a rigorous relation between directions of incident and diffracted beams, wave-length, constant of the grating, and order used. Two methods are given for the measurement of the plates.

SUN-SPOT AREAS FOR 1912.—Dr. Dyson communicates the usual annual summary relating to the areas and positions of sun-spots for the past year to the Monthly Notices of the Royal Astronomical Society (vol. lxxiii., No. 9), and its chief interest lies in the fact that that year and the present one includes the epoch of a minimum. In 1912 the mean daily spotted area was only thirty-seven millionths of the sun's visible hemisphere, while the values for 1910 and 1911 were respectively 264 and 64 millionths. Comparison is made between the years of minimum of the three preceding cycles; the values for 1878 gave an area of twenty-two, for 1889 an area of seventy-eight, and for 1901 an area of twenty-nine, so that the low value in the last-mentioned year is not quite attained in 1912.

Attention is directed to the fact that, up to September 12 of the current year, a "much feebler condition of sun-spot activity even than 1912" has been experienced, so that the sun-spot minimum now in progress is probably going to turn out an unusually low and prolonged one. Minima of this character have generally been followed by a slow rise to a low maximum. The fact that some small spots have been observed in high latitudes suggests the commencement of a new period of activity. It is interesting to note that since 1905, and including that year, the number of days on which photographs of the sun were taken have been either 364 or 365.

CURRICULA OF SECONDARY SCHOOLS.[1]

THE recently issued memorandum on the curricula of secondary schools displays with remarkable clearness the attitude of the Board towards educational problems. It is to be hoped that it will be widely read outside as well as inside the scholastic profession. Inevitably the influence of the Board on the work of the schools gets greater year by year, and it is vital to national progress that this influence should be exercised in a broad and enlightened spirit. We may state at once that we have never read an official document which gave us more reason to hope that the dangers of bureaucratic control will be avoided, while the opportunities for removing inefficiency and for coordinating and economising our educational resources will be watchfully grasped.

In the introduction we read:—"The present memorandum . . . is not intended to contain any dogmatic exposition of educational doctrine . . . the problems of education have to be re-stated for each generation . . . the Board could do no greater disservice than by attempting to check the spirit of exploration, experiment, and inquiry which should exist in every school. . . . Organisation alone cannot make a good school. The real success of the work depends on the harmonious activity of a well-equipped staff, and also—a fact not always sufficiently taken into account—on the cooperation of the parents."

Turning from these expressions of opinion, which, however excellent, are platitudes unless translated into practice, we find that the Board regards as cardinal and essential subjects "English language and literature, at least one language other than English, geography, history, mathematics, science, and drawing." Provision must be made for training in singing and manual work, and for promoting the physical development of the pupils. The memorandum lays emphasis on the fact that it is impossible for boys and girls to profit adequately if the duration of school-life be curtailed. The suggestion is put forward that some of the work hitherto restricted to technical schools may wisely be attempted in connection with the general education of the older boys and girls in the secondary school. The report truly states that, at present, time is often wasted in the middle and higher forms through the inefficiency of earlier teaching, through the absence of coordination (*e.g.* in the syllabuses for mathematics and science or for science and geography), and through the inclusion in the syllabuses of much that is trivial and unessential, to the neglect of what is of capital importance.

The question of insistence on Latin is left in a curious position. If only one foreign language be offered, the school is free to propose any language which is suited to the needs of the pupils and for

[1] Board of Education Circular 826. Price 2*d*.

which the instruction is efficient. If two languages are taken (other than English), one of the two must be Latin unless "the Board are satisfied that the omission of Latin is for the educational advantage of the school." This regulation has done injury to the study of German, and the British Science Guild and several teachers' organisations have objected. The Board now state that Latin will not be demanded if instruction therein is available in other accessible schools. The Board fear that the prospects of the pupils will be prejudiced if Latin is omitted, as they may be debarred from entry into professions and from university work in literary subjects. To the present writer it appears prejudicial to national progress that the education of thousands of boys and girls should be made less efficient because certain chartered corporations hold antiquated views regarding school curricula (on which subject they are seldom qualified to advise), or because those corporations may regard the exclusion of the un-Latined as a convenient social precaution.

The memorandum contains many useful suggestions with reference to the work of the more advanced pupils, and, so far as science is concerned, the recommendations will be approved by most of those who have had practical experience. Modified specialisation is the keynote—thus pupils specialising in science and mathematics should take English literature and composition and one foreign language, "which for those who have already spent some years in the study of French should by preference be German." Specialisation in art, economics, and domestic courses are also contemplated by the Board as permissible in selected schools, but with provision for the continuance of general education. As regards the main portion of the school, the study of science (including practical work) should extend continuously over four years. "This will be required in all schools unless special reasons to the contrary can be given." Boys who are working in preparation for an advanced course in classics may have a science course for three years (instead of four) between the ages of twelve and sixteen, if this course be supplemented by the inclusion of science among the subsidiary subjects taken at the specialising stage. This and similar statements in the memorandum should strengthen the resistance of enlightened headmasters to the injuriously narrow specialisation which still appears requisite for winning a scholarship at the older universities. G. F. DANIELL.

THE SPREAD OF THE METRIC SYSTEM.

IN a circular letter, dealing with the world-wide spread of the metric system, the Decimal Association points out that the time is soon coming when metric usage, instead of being regarded as a hindrance to British trade with the Far East, will have to be adopted as a necessity in our dealings with China, Japan, and Siam, which have each taken definite steps to establish that system. Already the Advisory Council of China has passed the first reading of a law to that effect, and two Chinese gentlemen are now in Paris studying the technical details of the subject. Japan has for the present four legal systems of weight and measure, but the Government has declared its preference for the metric system by making it obligatory for the services of the customs excepting a few articles. The metric system is taught in all the public schools of Japan, and is prescribed for the army, for medicine, and for electrical work. Siam has employed the system with success on its railways and public works for some years, and last year joined the International Convention of the Metre, from which it has received the apparatus needed for a Central Bureau of Standards at Bangkok. Siam proposes not to make metric reform compulsory at one and the same time in all parts of the kingdom, but to deal with each province separately at convenient times. Russia also has adopted the metric system for several purposes, and has announced to the Decimal Association that the metric system is favoured, but has to await the necessary arrangement of control and inspection throughout the Russian Empire. This conversion of Russia is notable as completing the solidarity of all Continental Europe in metric reform. All South and Central America are either metric or tending to be so. The Australasian Dominions of Great Britain have urgently pressed the question; and last, but most important of all, are the United States of America, which have gone far in preparing for reform, and will act with vigour when the time comes.

ZOOLOGY AT THE BRITISH ASSOCIATION.

SECTION D presented a full programme, the large number of communications rendering necessary morning and afternoon sessions. Interest in the proceedings was well maintained, good audiences being present throughout the meetings. A striking feature of this year's programme was the large number of papers dealing with vertebrate anatomy and morphology.

Some Aspects of the Sleeping Sickness Problem.

A lecture on this subject was delivered by Prof. E. A. Minchin. He referred briefly to the chief signs and symptoms of sleeping sickness, and described the main features of trypanosomes, remarking that the tendency of natural evolution appeared to be for the pathogenic species to adapt themselves to certain species of hosts, to which they become quite harmless. *Trypanosoma brucei, gambiense,* and *rhodesiense,* however deadly to domestic cattle and man, are harmless to the wild game, which appear to be their natural hosts. There is evidence that *T. rhodesiense* is a newly arisen strain of *T. brucei,* which has recently acquired the power of living in human blood, and, as a "new" parasite of man, is extremely virulent. Prof. Minchin pointed out the principal characters of tsetse-flies (Glossina), and the part played by certain species in transmitting the trypanosomes of sleeping sickness. In about 5 per cent. of the flies fed on infected blood, the trypanosomes ingested go through a complicated developmental cycle, multiplying in the fly's digestive tract, and, after a time, migrating forwards and passing into the salivary glands, where they establish themselves, multiplying constantly so long as the fly lives. It has been proposed to exterminate the wild game on a large scale in order to remove this "reservoir" of the disease, but Prof. Minchin considered it to be doubtful whether this would bring about the desired effect. Destruction of the game would remove only a portion of the reservoir, for ruminants generally, including domestic stock, can harbour the trypanosomes in question, and, further, such destruction, by removing the natural food of the flies, might cause the flies to move closer to human habitations, and hence increase the transmission of the disease among human beings and domestic stock. He hoped, therefore, that if game is to be destroyed, this will be done in limited areas only, until more accurate knowledge of the results has been acquired. He suggested that reduction of tsetse-flies might be effected, (1) by protecting the wild gallinaceous birds, by introducing species

not indigenous, and by encouraging the natives to keep domestic fowls round their villages, for such birds, when scratching up the ground, would find and destroy the pupæ of Glossina; and (2) in areas where *G. morsitans* is common, by tarring or stopping up in some way all holes in trees near the villages.

Bionomics of Amphidinium operculatum.

Mr. R. Douglas Laurie described observations, made chiefly on the Cheshire coast, on this Peridinian, which occurs in such numbers as to form brownish-green patches on the sand, just below high-water mark of spring tides. The organism exhibits three periodicities. (1) A daily periodicity; during the latter half of February the patches were very evident on the surface of the sand until 10 a.m., then the organisms retired below the surface, reappearing shortly after noon, and reaching a maximum from 2 to 4 p.m., after which they again disappeared. Experiments indicate that light and tide are the determining factors, temperature being apparently unimportant. (2) A lunar periodicity, "spring" periods of activity, alternating with "neap" periods of inactivity, being correlated with the amount of water in the sand, for the neap tides do not reach the region inhabited by Amphidinium. (3) An annual periodicity, a strongly marked maximum from February to the end of April being followed by decrease during May and June. The patches have not been seen on the sand since the first week of July, though microscopic examination showed that a few Amphidinium were still present. Mr. Laurie described a large and more elongate form of Amphidinium, which he is inclined to regard as a distinct species.

Influence of Osmotic pressure on the Regeneration of Gunda.

Miss Jordan Lloyd described observations on the small marine triclad Turbellarian, *Gunda ulvae*, which lives in great numbers at Plymouth, between tide-marks, and near the course of a small stream. The specimens employed in the experiments were about 5·5 mm. long, and were cut transversely into two equal parts. The regeneration of the posterior region only was considered. Whole worms can live in water having an osmotic pressure between 2 and 33 atmospheres. Regulation of an anterior portion of Gunda, resulting in the production of a complete worm, takes fifty days in water having an osmotic pressure between 15 and 22·5 atmospheres (the latter being that of ordinary sea-water). Lowering the osmotic pressure below 15 atmospheres retards the rate of regulation proportionately, and below 5 atmospheres no regulation occurs. Raising the osmotic pressure above 22·5 atmospheres retards the rate of regulation, and above 30 atmospheres no regulation occurs. The new posterior region is formed by the migration of large numbers of parenchyma-cells to the region of the wound, where they aggregate and build up the new organs. Inhibition of regulation seems to be due to some factor which checks the migration of the parenchyma-cells. In examples showing retarded regulation, irregularities in the mitotic divisions of the parenchyma-cells have been noticed.

Habits and Building Organ of the Tubicolous Polychaete, Pectinaria koreni.

As the result of his observations on living Pectinaria, Mr. Arnold T. Watson considers that the process of tube-building is as follows:—A working space is first cleared, the sand around the lower, wider end of the tube, which is well below the surface, being removed by a very strong upward current, created within the tube by peristaltic action of the body-wall of the worm. This current causes the sand to pass rapidly through the tube, between it and the dorsal body-wall of the worm, and to be ejected through the small upper end of the tube, forming a mound on the surface of the sea-floor. A supply of sand is then carried by the tentacles to the head of the worm; one portion of this sand is swallowed for food and passes through the body of the worm, a second portion is carried by papillæ, which form a track from the ventral edge of the peristomium to the bilobate building organ just below, on reaching which, each grain accepted for building purposes is received and held between the two lobes. These lobes apply the sand-grain to the free edge of the tube, where it is fixed by the cement poured out by the underlying cement-gland.

Eelworms.

Mr. Gilbert E. Johnson described some of the more recent work on eelworms (Anguillulidæ), a group of microscopic round-worms which, besides purely free-living forms, includes species living saprozoically in decaying substances, while others are parasitic in animals and plants. The saprozoic forms (Rhabditis, &c.) find their nourishment and multiply rapidly among the swarms of bacteria flourishing in substances decaying in the soil and elsewhere, though whether the worms feed on the bacteria or on the products of their action is not yet known. The few species inhabiting animals, and regarded as parasites, are well exemplified by *Rhabditis pellio*, the larvæ of which inhabit the cœlom and nephridia of the earthworm. Mr. Johnson traced the life-history of this species, showing that the active forms in the nephridia, and the encysted forms in the cœlom, remain larval until the earthworm-host dies and decays in the soil. Then the eelworms feed in its decaying carcase, grow rapidly, become mature, and reproduce. When the nourishment from the dead earthworm is exhausted, the larvæ wander into the soil and infect another worm, entering by the nephridiopores into the nephridia, and by the dorsal pores into the cœlom. The larvæ entering the cœlom are attacked as foreign bodies by the amœbocytes, and encyst. It is doubtful whether the term parasite should be used for this species, since the mode of nourishment is saprozoic. Other well-known eelworms—Tylenchus, Aphelenchus, and Heterodera—pierce the cellular tissue of plants by means of the hollow stylet protrusible from the mouth-cavity, and absorb the cell-sap. There are also numerous "semiparasitic" forms, which occur round the roots of ordinary healthy plants, and apparently do no damage, but it would be interesting to ascertain what would be the result of their absence on the health of the plant.

The Larva of the Star-fish, Porania pulvillus.

Dr. J. F. Gemmill has traced the development of this star-fish. The eggs are small, and the general larval history is similar to that of *Asterias rubens*. The late larva is a brachiolaria with a well-marked sucker, and numerous small papillæ on and between the brachia. The features of special interest presented by the larvæ were:—(1) The presence, in early larvæ, of possible rudiments of a posterior enterocœlic outgrowth; (2) the occurrence, among the later larvæ, of several specimens with double hydrocœle formation; and (3) the presence, in normal and in double-hydrocœle larvæ, of a "madreporic" vesicle, the floor of which contracted rhythmically during life.

Observations on Artemia salina.

Mr. T. J. Evans recorded observations made on this Crustacean, in graded strengths of sea-salt solution from 4 to 25 per cent. It was found that the

Artemia, in 8 and 10 per cent. solutions, attained maturity without the introduction of extraneous food. The food supply was Chlamydomonas sp. in various stages of its life-cycle. The nauplius stages of Artemia die unless the brine contains a supply of free-swimming monads, but the adults live on the resting stages of the monads. The food supply present in the surface film is so great that Artemia spends much of its time feeding there, and it is probable that the habit of swimming on its back was adopted by Artemia as an adaptation for feeding in the surface film. In 4 and 5 per cent. and in 20 and 25 per cent. brine-solutions, either the eggs did not hatch or the young nauplii died as soon as the eggshell burst. Adults transferred from the optimum solutions (8 and 10 per cent.) lived in the weaker and stronger brines, and the eggs laid by them lived. It was found that eggs would hatch in any brine solution in which they had been produced. No variation of the order described by Schmankewitsch was found; the tail-lobes were of uniform size in all strengths, and possessed the same number of spines.

Pseudohermaphrodite Examples of Daphnia.

Dr. J. H. Ashworth directed attention to four abnormal female examples of *Daphnia pulex*, in each of which the antennule of one side resembled that of a male. No other male secondary sexual character was present, except that in one case the margin of the carapace presented almost the configuration of that of a male. The reproductive organs of all the specimens were normal ovaries, and were not parasitised. The offspring of two of the specimens were examined and found to be all normal.

Position of the Order Protura.

Mr. R. S. Bagnall discussed the position of the order Protura, to the "abdominal feet" of which he did not attach so much importance as some authorities have done. While recognising the affinities of the Protura to the Chilopoda, he considered the relationship with the Insecta to be closer.

Mr. Bagnall also gave a brief account of the hymenopterous parasite, *Thripoctenus russelli*, found in the larvæ of the bean thrips, *Heliothrips fasciatus*. He also recorded Thripoctenus found in association with various thrips in several English localities, and commented on the economic importance of these parasites of thrips.

Oviposition of a Fly on Centaurea.

Prof. Hickson communicated a paper by Mr. J. T. Wadsworth on the oviposition of the Trypetid fly, *Urophora solstitialis*, on *Centaurea nigra* and allied composites. This fly possesses a highly developed piercing ovipositor, which, when fully extended, is nearly twice the length of the fly. During oviposition the abdomen of the fly is pushed down between the bases of the lowest and outermost bracts of the flower-head, and the piercing portion of the ovipositor is forced downwards and inwards towards the axis of the flower-head, and then gradually bends upwards until its tip is finally in the space between the young florets and the overlying bracts, in which space the ova are deposited. The larva, after hatching, burrows through the corolla of a young floret, travels down to the ovary, and feeds there, its presence causing the growth of a "gall."

Observations on a West African Wasp.

Prof. Poulton recorded observations by Mr. W. A. Lamborn, in Southern Nigeria, on the wasp, *Synagris cornuta*, in the males of which there is remarkable difference in the grade of mandibular development. A male with very large mandibles terrorised four others with smaller mandibles, and was thus successful in capturing a female (the case being one of marriage by capture), which emerged from a nest under Mr. Lamborn's observation. Prof. Poulton suggested that the immense horn-like mandibles are a disadvantage in obtaining food and perhaps in other ways in the struggle for life, and that the emergence of the females covers a period long enough for this struggle to tell, so that the males with small or rudimentary "horns" have the advantage in the end through the operation of natural selection, while the others have the advantage at the beginning through sexual selection in the form of battles between the males.

Heredity of Melanism in Lepidoptera.

Mr. W. Bowater described experiments on various melanic Lepidoptera. He pointed out that in *Amphidasys betularia* the melanic form is now more common than the typical form, and stated that a breeding experiment seemed to point to the Mendelian dominance of melanism in this species. He also recorded the results of pairings of typical and melanic examples of *Odontoptera bidentata*. He found that distinct segregation occurred, that homozygous and heterozygous melanic forms were indistinguishable, that extracted types bred as true homozygotes, and that two heterozygous blacks, when paired, gave, in eight families, 75 per cent. black and 25 per cent. type. Mr. Bowater claimed that the specimens bred, 1800 in number, proved that melanism in this species is a simple Mendelian dominant.

Pseudacraeas and their Acraeine Models on Bugalla Island, Victoria Nyanza.

Dr. G. D. H. Carpenter found that on Bugalla Island, in the Sesse Archipelago, Victoria Nyanza, there abounds a species of Nymphaline butterfly, *Pseudacraea eurytus*, which has several forms closely mimetic of various species of the Acræine genus Planema. The 356 specimens of Pseudacræa caught by him in 1912–13 were excessively variable, intermediates between the various forms being as common as the types. Such intermediates are of the rarest occurrence on the mainland shore of the lake at Entebbe (twenty-five miles N.E. of Bugalla), but the typical forms abound there. On Bugalla Island the model Planemas are very scarce, probably from scarcity of the food-plant, so that their presence can be of little protective value to the Pseudacræas; hence any specimen which exhibits variation away from the type of the model has as much chance of escaping enemies as a form which closely resembles the model. On the mainland, however, Planemas are plentiful, so that their presence is of definite selective value for the mimics; consequently variations of the mimic are at a disadvantage in the struggle for existence, and are rarely found on the mainland, but the typical mimetic forms are abundant. It was claimed that this case afforded strong evidence of the reality of mimicry, and of the power of natural selection to keep up the mimetic likeness.

Geographical Relations of Mimicry.

Dr. F. A. Dixey pointed out that certain definite schemes of colour and pattern in the wings of butterflies are characteristic of certain definite geographical regions and even of smaller districts, and cited in illustration the well-known combination of red, black, and yellow Ithomiine, Heliconiine, Nymphaline, and Pierine butterflies in Central and South America. He remarked that it was natural to seek for an explanation in the direction of a common influence exercised by the geographical environment, but that this ex-

planation is attended by such extreme difficulty as to be practically put out of court. The interpretation which at present holds the field is that which attributes the resemblances in colour, with their correlated geographical modifications, to the action of mimicry, either Batesian or Müllerian.

Mimicry.

Prof. Poulton opened what was intended to be a discussion on mimicry, but the opposition did not appear to be present in force, and there was not a real debate. Prof. Poulton directed attention to the injuries actually seen to be inflicted on butterflies by wild birds, and laid stress on disabling injuries, such as the loss of a whole wing or the head, indicating that the insect had not escaped, but was abandoned by the enemy. Such injuries are especially characteristic of the great groups which supply the models for mimicry, *e.g.* the Danainæ and Acræinæ in Africa. The crops of enormous numbers of birds have been examined and stated to contain no remains of butterflies, but Prof. Poulton contended that the force of this requires reconsideration in the light of the recent work of Mr. C. F. M. Swynnerton in south-east Rhodesia. Pellets thrown up by captive insectivorous birds had been collected by Mr. Swynnerton, and were exhibited at the meeting, together with examples of butterflies belonging to the same species as those devoured. These pellets, when broken up, would have come under the well-known classification, "insect débris, unrecognisable," but Mr. Swynnerton has shown that no safe conclusion as to the nature of the pellets can be drawn except after microscopic examination sufficiently minute to detect the presence of lepidopterous scales and their sockets. The objection against the origin of mimicry by small variations was met by the exhibition of mimetic females of *Acraea alciope*, from the west coast of Africa and from western and eastern Uganda. In the first series the female Acræas mimic the brown male (and in some species the female also) of the Acræine genus Planema, in eastern Uganda, they mimic the male of *P. macarista*, and the male and female of *P. poggii*, with an orange bar across the fore-wing and a white bar across the hind-wing. In western Uganda the transitional forms are found, some of the female Acræas exhibiting a pattern similar to that of the west coast form, while others show an incipient white bar across the hind-wing, but the fully formed eastern mimic is not known to occur in this locality. In the intermediate zone of country the intermediate variation is met with, connecting the western mimic with the eastern. Prof. Poulton cited examples of mimicry between the genera of certain African Nymphalines, pointed out the development of secondary resemblances between the mimics, and exhibited series of models and mimics taken in one sweep of the net in Lagos, thus showing that the mimics actually fly in the company of their models. He also showed illustrations and specimens of a few cases of mimicry in temperate North American butterflies, and pointed out what he believed to have been the evolutionary history. If this history be correct, then it is impossible to explain the resemblance as due to the influence of environment, because recent invaders from the Old World into this region have caused the mimetic modification of indigenous species. According to the theory of environment the invaders and not the residents ought to have been modified.

Prof. van Bemmelen remarked that mimetic resemblances required to be very carefully analysed. He had attempted to show that some of the patterns on the wings of butterflies were old and others new, and he suggested that some resemblances might be traceable to a pattern existing far back in phylogeny, and that the subject should be further investigated from this point of view.

Other Papers on Lepidoptera.

Sir George Kenrick discussed the classification of the Pierines, and Mr. G. T. Bethune-Baker exhibited, with the aid of the epidiascope, specimens showing changes in pattern, colour, and structure (*e.g.* the genitalia) in the Ruralidæ which lead him to conclude that pattern is very generally correlated with structure. Mr. G. D. H. Carpenter communicated observations on the enemies of "protected" insects with special reference to *Acraea zetes*. Such insects, "protected," for instance, by their distastefulness from the attacks of vertebrates, are preyed upon by predaceous insects and parasites.

The Ascidian Diazona violacea.

Prof. Herdman exhibited specimens of this compound Ascidian, which he had dredged recently in the Hebrides. When alive the colony was bright green, but when preserved in alcohol it became violet in colour. Other specimens preserved in formalin retained their green colour. Green specimens dredged from deep water changed their colour in sunlight, and finally acquired a violet tint. The green colour is not due to chlorophyll, but to an allied pigment which has been named syntethein. The green Hebridean and the violet Mediterranean form are undoubtedly the same species.

Early Evolution of the Amphibia.

Mr. D. M. S. Watson described the osteological characters of the Amphibia of Carboniferous, Permian, and Triassic formations, and concluded that, taken as a whole, the rhachitomous Amphibia of the Permian are intermediate in their structure, as they are in time between the embolomerous Carboniferous and the stereospondylous Triassic types, and it would seem that each of the three groups is to be regarded as ancestral to that which follows it. The almost absolute identity of the skulls of Pteroplax, an embolomerous Amphibian of Carboniferous type, and Seymouria, which has the most primitive skull of any known reptile, seems to show definitely that the reptiles did arrive from that group of Amphibia, presumably in early Carboniferous or Upper Devonian time. Mr. Watson suggested that the development of the bi-condylar articulation of the skull of Amphibia is to be correlated with the increasing depression of the skull, and is a characteristic Amphibian feature.

Prof. Elliot Smith referred to the difficulty presented by the Amphibian cerebral cortex in regard to the phylogeny of the mammalia. He pointed out that in Petromyzon the cerebral cortex is rudimentary, in Selachians it is more highly developed, and in Dipnoi is almost as well developed as in reptiles, but in Amphibia is degenerate and feebly efficient. But Amniota must have gone through some Amphibian ancestry. It is now evident that the retrogression of the Amphibian cortex must have taken place since the reptiles branched off the Amphibian stem.

Metamorphosis of the Axolotl.

Mr. E. G. Boulenger gave an account of the experiments which he had recently conducted on the metamorphosis of the Mexican axolotl (*Amblystoma tigrinum*). He concluded that the axolotl will, with a few exceptions, transform if placed under special conditions which force it to breathe air more frequently than usual; that starvation, irregular feeding, and temperature have no influence on the metamorphosis; that elimination of oxygen from the water

has likewise no bearing on the point, as, in these circumstances, the animal will not rise to the surface and use its lungs at more frequent intervals than animals placed under normal conditions. Mr. Boulenger stated that up to a certain point only could the shrinking gills and fins of the animal be made to undergo renewed development (when transferred from shallow to deep water).

Homology of the Gills.

Prof. H. Braus described the results of a number of transplantations carried out on the larvæ of Rana, Hyla, and Bombinator by Dr. Ekman. The gill-ectoderm was detached before the gills had formed, and was transplanted to some other parts of the tadpole. Such gill-ectoderm gave rise to gill-filaments, but not to gill-clefts; circulation of the blood was also wanting, and the filaments soon perished. If the gill-ectoderm was raised, turned round through 180°, and replanted on the same area, gill-filaments were formed with circulation and gill-clefts, the latter being turned 180° from the normal position. It is concluded, therefore, that the ectoderm alone is able to produce gills, and determines their position and form, but the further development of the gills is dependent on the ingrowth of mesoderm (vascular system). "Foreign" ectoderm, *i.e.* ectoderm which under ordinary circumstances does not develop gills, behaves differently according to the part of the organism from which it is taken. That taken from the trunk or the dorsal part of the head and planted in the position of the gill-ectoderm does not give rise to gills, but if ectoderm be taken from the region above the embryonic heart and transplanted to the position of the gill-ectoderm, there are formed gill-filaments and clefts as in the normal animal. It is not yet certain what factors induce this ectoderm to imitate the gill-ectoderm, but Prof. Braus regards this imitation as of fundamental importance in relation to theories of homology.

Cultures of the Embryonic Heart.

Prof. Braus exhibited by the microkinematograph the beating heart of a tadpole (6 mm. long), which had been in the culture-medium seven days when the photographs were taken. He demonstrated the regular rhythm, about eighty beats per minute, the suspension and irregularity due to the chemical rays of light, also typical "refractory" periods, and the growth of the pigment cells. At this period of development the heart has no ganglion cells and nerves are not present, nor are muscle-cells distinguishable; it seems therefore that the protoplasmic links between the cells must be the conductors of the stimuli which pass along the heart.

Phylogeny of the Carapace and Affinities of the Leathery Turtle.

Dr. Versluys directed attention to the special characters exhibited by the carapace of the leathery turtle (*Dermochelys coriacea*), pointing out that in other Testudinata the carapace is formed by a relatively small number of plates firmly united to the vertebræ and ribs, but in Dermochelys the carapace is composed of a number of small thin plates, forming a mosaic, separated from the inner skeleton by a thick cutis. Dermochelys is not primitive, for its cervical vertebræ show that it is derived from a Cryptodiran ancestor. That this ancestor possessed the typical carapace is shown by the fact that parts of it are still found in a reduced state in Dermochelys represented by the deeper or "thecal" layer of the dermal skeleton. Prof. Dollo has maintained that the "epithecal" skeleton is a new formation, but Dr. Versluys is inclined to assume that, in the ancestors of the Testudinata, there were rows of epithecal elements (though feebly developed) beginning in the neck and continuing over the thecal shell to the base of the tail, and that the ancestors of Dermochelys reduced their heavy thecal shell and replaced it by the new mosaic shell formed by a proliferation of the marginals and other epithecal elements.

Prof. Dollo discussed Dr. Versluys's conclusions, and stated the reasons which led him still to regard the mosaic carapace of Dermochelys as an entirely new structure. He held that a study of fossil Chelonians permitted no other interpretation. He did not consider Archelon (Upper Cretaceous) as an ancestor of Dermochelys, but rather Eosphargis (Lower Eocene), because of the nature of the plastron.

In reply Dr. Versluys said that whether or not Archelon was an ancestor of Dermochelys, both possessed an epithecal mosaic carapace, of which the marginals formed part.

Unilateral Development of Secondary Male Characters in a Pheasant.

Dr. C. J. Bond exhibited the skin of the white-ringed Formosan variety of the Chinese pheasant, the plumage on the left side of which was roughly that of the adult male. The left leg showed a spur, but there was no spur on the right leg. The white-ringed neck feathers occurred in a half-circle on the left side only; the wing primaries and coverts were female in character, except for a few male feathers on the left side; the tail coverts were of the male type. A well-developed oviduct was present on the left side, and a sexual organ was in the usual position of the left ovary, but sections showed that it consisted of ovarian elements undergoing pigmentary degeneration and testicular elements in active growth. Dr. Bond pointed out that such a case presented a difficulty if the ordinary or hormonic explanation of the origin of secondary sex characters were accepted. He suggested that two factors at least are concerned in the origin and development of secondary sex characters: one, a gametic factor—the primary sex gland, and the other a somatic factor, and that the two factors may vary independently of each other under certain conditions of abnormal hereditary transmission.

A Mammal-like Dentition in a Cynodont Reptile.

Dr. W. K. Gregory exhibited, for Dr. R. Broom, upper and lower jaws of a small species of Diademodon, from a study of which Dr. Broom concludes that the Cynodonts had deciduous incisors, deciduous canines, and four deciduous premolars, exactly as in mammals. As there is no evidence, in any specimen, of a dental succession after maturity has been reached, he concludes that the two sets of teeth correspond to the mammalian milk set and permanent set.

Notharctus, an American Eocene Lemur.

Dr. W. K. Gregory exhibited a skeleton of *Notharctus rostratus*, an Eocene lemur, the discovery of several partial skeletons of which in Wyoming, by the American Museum of Natural History, affords material for a fairly complete knowledge of the skull, dentition, limbs, and vertebræ. The material shows that Notharctus is a primitive lemur, more primitive than any now living, and possibly ancestral to the Indrisine lemurs. The correspondence in the details of limbs, &c., between Notharctus and modern Lemuridæ is remarkably close, but the front teeth of the former are more primitive and have not assumed the lemurid characters; the molars are in pattern ancestral to those of Propithecus.

Dr. Gregory discussed the phylogeny of the primates, which he divided into three series:—(1) Lemuroidea, including Prolemures (Notharctidæ, Adapidæ), Lemures, and Nycticebi; (2) Pseudolemuroidea; (3) Anthropoidea. The Prolemures are the lowest and most generalised, and contain the ancestors of the Lemuridæ and Indrisidæ. Nesopithecus and other ape-like lemurs with enlarged brain-case are closely allied to the Indrisidæ, and their resemblances to the Anthropoidea are demonstrably convergent, not genetic. The oldest known platyrrhine, Homunculus, of the Patagonian Santa Cruz formation, is definitely a Cebid. The oldest Anthropoidea are those described by Schlosser from the Upper Eocene of Egypt, and they show no special approach to the platyrrhines. The Hominidæ are linked securely with the Simiidæ, not only by the abundant evidence of anatomy and physiology, but also by recent palæontological discoveries.

Morphology of the Mammalian Tonsil.

Miss M. L. Hett gave an account of the principal types of tonsil found in mammals. Tonsils are normally present, and do not atrophy until extreme old age (except in man), in most of the mammalian orders, but they are wanting in many rodents, some insectivores, and most bats. The gross anatomy of the tonsils is very distinctive for each group of mammals, being always characteristic of the order, and frequently also of the family, or even, in some cases, of the genus. Miss Hett remarked that it was not easy to show, in the case of this organ, an actual correlation between structure and habit, but it was worthy of note that the tonsils of carnivorous marsupials bear a remarkable resemblance to those of Eutherian carnivores.

Several other papers were read, which, however, do not lend themselves to the purpose of a summary. Prof. Poulton pointed out that the term mutation has been employed in three different senses, and suggested that it should be restored to its original use and that new terms be employed for the other two uses of "mutation," and for the two kinds of "fluctuation." Mr. R. H. Whitehouse discussed the evolution of the caudal fin of fishes, and the morphology of the elements of the fin. Prof. R. J. Anderson presented notes on the skull and teeth of Tursiops and on the skeletal elements of vertebrate limbs; the Rev. Dr. Irving exhibited teeth and limb bones of the Solutré type of horse from the Stort valley; Mr. Forster Cooper gave an account of Thaumastotherium, a new genus of Perissodactyles; Dr. W. S. Bruce exhibited a series of photographs of the new zoological gardens near Edinburgh, and Mr. F. Coburn submitted observations on the migration of birds over the midland district.

By the courtesy of Major C. C. Hurst, about eighty members of Sections D, K, and M were invited to inspect the Burbage Experimental Station for applied genetics. Attention was particularly directed to six series of exhibits, of each of which Major Hurst gave a brief explanation and demonstrated the special features shown:—(1) garden races of Antirrhinum, illustrating the inheritance of minute variations in tint, height, and habit of growth; (2) segregation of specific characters in F_2 hybrids of Berberis; (3) breeding experiments with racing pigeons, with the view of investigating the transmission of homing powers; it is interesting to note that feeble-mindedness behaves as a recessive in birds; (4) breeding experiments with Dutch rabbits, with respect to the inheritance of coat-colour and markings; (5) the colt of a pure-bred shire mare and a thoroughbred stallion; (6) breeding experiments with poultry, which suggest that both the male and female parents transmit to their daughters factors for egg-size and egg-colour, that the smaller grade egg is dominant to the larger grade, and the darker tint dominant to the lighter.

J. H. ASHWORTH.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—In a paragraph last week (p. 362) it was stated that the number of students receiving instruction in the school of agriculture was 320. Prof. T. B. Wood, Drapers Professor of Agriculture, informs us that the correct number is about one-third of that stated. The mistake arose by adding together the number of students in each of the three terms.

THE Swiney lectures on geology in connection with the British Museum (Natural History) will be given this year by Dr. T. J. Jehu, his subject being "The Natural History of Minerals and Ores." The lectures will be delivered in the Metallurgical Lecture Theatre of the Imperial College of Science and Technology, Exhibition Road, South Kensington, on Mondays and Tuesdays, at 5 p.m., and Saturdays at 3 p.m., beginning Saturday, November 29, and ending Tuesday, December 23. Admission to the lectures is free.

IT is announced in *Science* that complete plans for the new home of the Massachusetts Institute of Technology have now been made public. There are to be nine contiguous buildings, each devoted to a separate department. Building operations have already been started. The principal buildings are expected to be ready for occupancy in two years. Of the 2,000,000*l.* necessary, 1,460,000*l.* has been already promised. From the same source we learn that the Chamber of Commerce of New York City has received a gift from a donor whose name is withheld of 100,000*l.* for a building for a college of commerce. Gifts have also been received of 10,000*l.* from four other subscribers. The Chamber of Commerce proposes to provide a building and to install a commercial and civic museum on condition that the City of New York provides the working expenses.

THE conditions of admission to the new Register of Teachers were approved finally at the meeting of the Teachers' Registration Council held on November 21. The conditions of registration are set out in the text of the regulations which was published in full in *The Times* of November 22. The register will contain the names of all registered teachers in alphabetical order in one column, with the date of registration, and a further statement of attainments, training, and experience. Among the conditions approved under which entries may be made on the register the following may be mentioned:—The candidate must have obtained one of a number of the qualifications specified, produce satisfactory evidence of having completed successfully a year's course of training, and of having had a three years' period of experience as a teacher. In addition, applicants must be twenty-five years of age, and pay a fee of one guinea. Teachers not satisfying these conditions may, up to December 31, 1918, apply for registration if they have had five years' approved experience of teaching, or ten years' not mainly or solely employed in teaching. The period of experience will be reduced if evidence of a year's training can be given. The certificate of registration is valid for nine years, and can then be renewed without fee.

WE have received an interim report of the Book Production Committee of the Library Association.

The inquiries of the committee began in 1905, and have resulted in the formulation of a number of recommendations, which, however, are published as "under revision." With most of the recommendations all who have to use books will cordially agree. Thus the committee advise that the title-page should be dated in the case of all copyright books with the dates of previous impressions on the back or on the half-title. Each book should contain a list of contents and an index, and the headlines should be descriptive of the contents of the page. One of the most important and difficult parts of the inquiry related to the quality of the paper used in books, and a classification into four types was adopted: (1) papers of light, spongy character, or featherweight; (2) printing papers with a moderate finish or surface, containing not more than 15 per cent. mineral matter; (3) highly surfaced printing papers; (4) so-called "art" papers surfaced on both sides with mineral matter. Class (2) is recommended for books intended to resist a normal amount of wear, papers in classes (1) and (4) being quite bad from the point of view of durability. Class (3) is a compromise between (2) and (4), and the committee evidently prefers to use class (2) for reading matter and for illustrations also where the use of half-tone blocks can be avoided. When the illustrations are of a kind which demands a surfaced paper, "it seems reasonable to suggest that the letterpress should be printed on ordinary paper and the illustrations on a thin art paper coated on one side only, the illustrations being guarded into the book." There are recommendations with reference to printing, book-illustration, and binding, and the report is the result of careful work by experts in the subjects dealt with. The establishment of the London County Council classes in book production was an indirect result of their earlier labours, and we shall look forward to a further report, when we hope that the question of legibility will receive more consideration, especially the influence upon eyesight of the surface, thickness, and texture of the paper used for printing.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 20.—Sir Archibald Geikie, K.C.B., president, in the chair.—Dr. D. H. **Scott**: *Medullosa pusilla*. Medullosa is a genus of fossil plants, with structure preserved, from the Carboniferous and Permian. Only one British species has so far been known, *Medullosa anglica*, from the Lower Coal Measures, the oldest and simplest member of the genus, with three uniform vascular cylinders. *Medullosa pusilla* from Colne, Lancs., is a closely allied form of remarkably small size and somewhat simplified structure.—Prof. A. F. S. **Kent**: Neuro-muscular structures in the heart. The paper deals with the relations of the structures at the auriculo-ventricular junction. Nerve fibres and nerve cells, the exact functions of which are open to conjecture, are numerous in the neighbourhood of the junction. The present work shows that these nervous elements are associated with structures which lie in the connective tissue between the auricular muscle and the ventricular muscle.—George **Graham** and E P. **Poulton**: The alleged excretion of creatine in carbohydrate starvation.—J. A. **Gardner** and P. E. **Lander**: The origin and destiny of cholesterol in the animal organism. Part xi., The cholesterol content of growing chickens under different diets.—W. E. **Bullock** and W. **Cramer**: Contributions to the biochemistry of growth—the lipoids of transplantable tumours of the mouse and the rat.

Physical Society, November 14.—Prof. C. H. Lees, F.R.S., vice-president, in the chair.—H. R. **Nettleton**: The thermal conductivity of mercury by the impressed velocity method. The paper gave an account of the determination of the thermal conductivity of mercury at the ordinary temperature of the room by the impressed velocity method first described by the author in the Proceedings of this society, vol. xxii., 1910. A mean value of 0·0201 c.g.s. units at 15·5° C. is obtained for the thermal conductivity.—Dr. A. W. **Ashton**: Polarisation and energy losses in dielectrics. The object of the paper is to discuss the relations which should exist between the coefficients in Pellat's equation (as modified by Schweidler), giving the displacement in a viscous dielectric as a function of the time of charge and the P.D.—F. J. **Harlow**: A lecture experiment to illustrate ionisation by collision and to show thermo-luminescence. A method of demonstrating to an audience both ionisation by collision and the reduction of the sparking potential by the presence of initial ionisation is described in the paper.

PARIS.

Academy of Sciences, November 17.—M. F. Guyon in the chair.—Charles **Moureu** and Emile **André**: The thermochemistry of acetylene compounds. The heats of combustion and formation of thirty-three acetylene derivatives have been determined, and compared with the analogous ethylene and saturated compounds. The addition of a molecule of hydrogen to acetylene derivatives evolves about 80 calories in the fatty series, rather less in the aromatic series.—A. **Laveran**: Macacus and dogs are affected similarly by Indian and Mediterranean kala-azar. An experimental proof of the identity of these two diseases.—Georges **Charpy** and André **Cornu**: The influence of silicon on the solubility of carbon in iron. As the silicon increases, the solubility of carbon in iron decreases, becoming practically nil at 900°, for 4 per cent. silicon, and at 1000° C., with 7 per cent. of silicon.—M. **Gosselet** was elected a non-resident member.—M. **Giacobini**: The return of the Giacobini comet (1900 III.). The comet 1913*e* is shown to be identical with the Giacobini comet (1900 III.).—E. **Keraval**: A family of triply orthogonal systems.—M. **Tzitzéica**: Conjugated networks.—Zoárd de **Geörge**: The quadrature of varieties.—Kampé du **Fériet**: The ultraspherical polynomials $V^{(s)}_{m_1 \ldots m_p}$.—Léon **Brillouin**: The propagation of a luminous signal in a dispersive medium.—Pierre **Weiss** and Auguste **Piccard**: The magnetisation of nitric oxide and magneton.—E. **Ariès**: Remarks on the coefficients of thermo-elasticity.—M. **Billon-Daguerre,** L. **Medard,** and H. **Fontaine**: A new arrangement of the mercury lamp. A description of a quartz mercury-vapour lamp, giving about 3000 candles for an expenditure of 1250 watts. The lamp causes practically no heating effects, and the light can be condensed on a celluloid film without danger. The point of light is absolutely fixed, and requires no adjustment in use.—G. **Moreau**: Electric couples in flames. An account of some electrical effects noticed when two platinum plates, one bearing a trace of a salt and the other clean, are heated together in a flame.—M. de **Broglie**: A new method giving photographs of line spectra with Röntgen rays.—F. O. **Germann**: Revision of the density of oxygen. The density of the air of Geneva. The oxygen in these experiments was prepared by heating potassium permanganate, passed over solid potash, phosphoric anhydride, and mercury, and further purified by fractional distillation. Using four different density globes, eleven observations gave a mean density of 1·42904 (extremes 1·42815 and 1·42941). A second set, in which the oxygen was not distilled, gave a mean value 1·42923; a third set, similar treatment to first

series, but gas passed in addition over heated platinised asbestos, gave 1·42905. The final mean of the fifteen observations of the first and third series was 1·42906. —Eug. **Wourtzel**: The decomposition of hydrogen sulphide by the radium emanation. The amount of gas decomposed was studied with respect to the effects of temperature and pressure.—Paul **Pascal**: Complex salts of uranium.—N. D. **Costeanu**: The action of carbon dioxide upon boron sulphide. The reaction was found to correspond to the equation

$$B_2S_3+3CO_2=B_2O_3+3CO+3S.$$

—Albert **Granger**: The colorations arising in glasses containing copper. A satisfactory blue colour is obtained in a glass containing only 0·05 CuO for one molecule of the base. A larger proportion of copper gives a greenish shade, especially in glass with a high proportion of alkalies.—F. **Bodroux**: The catalytic esterification in aqueous solution of some primary alcohols of the $C_nH_{2n+2}O$ series.—H. **Mech**: The products of condensation of the nitro-benzyl chlorides with acetylacetone, methylacetylacetone, and the cyanacetic esters.—Roger **Douris**: The action of mixed organo-magnesium derivatives upon the dimeric aldehyde from crotonaldehyde.—MM. **Desgrez** and **Dorléans**: The antagonism of the properties of guanine and adrenaline. The toxicity of adrenaline is diminished to a certain extent by the action of guanine, the adrenalinic glycosuria being notably reduced.—R. **Fosse**: The identification of urea and its precipitation in extremely dilute solutions. The reagent proposed is xanthydrol. This precipitates dixanthylurea, of high molecular weight. In a solution containing one-millionth part of urea, 0·01 mgr. can be detected microscopically. From 0·03 to 0·05 gram of urea can be separated and identified by analysis. Details of the technique are given.—Henri **Piéron**: The mechanism of the chromatic adaptation of *Idotea tricuspidata*.—Albert **Michel-Lévy**: The limiting age of the granite in the Mâconnais and Beaujolais mountains.—O. **Mengel**: The eastern termination of the synclinal of Mérens-Villefranche.—G. **Depape**: The presence of *Ginkgo biloba* (*Salisburya adiantifolia*) in the Lower Pliocene of Saint-Marcel-d'Ardèche.—Arthur L. **Day** and E. S. **Shepherd**: Water and magmatic gases. It has been stated that the gases emitted by the crater of Kilauea do not contain water. Gas samples were taken directly from a lava fountain at the bottom of the crater, and proved to contain steam in considerable quantity, in addition to large proportions of sulphur dioxide and carbon dioxide. Carbon monoxide, hydrogen, and nitrogen were also present in these gases. Analyses are also given of the solid matter contained in the water deposited from the gas samples.

CAPE TOWN.

Royal Society of South Africa, October 15.—The president in the chair.—R. **Marloth**: A new mimicry plant (*Mesembrianthemum lapidiforme*). In summer the plant consists only of two fleshy bodies (the leaves), which are half buried in the sand. Each leaf is about 1 in. to 1½ in. in length and width, shaped like a tetrahedron with blunt edges and angles, and brownish-red in colour, like the angular fragments of stone among which the plant grows. It is consequently very difficult to detect even in localities where its occurrence is known. In spring the plant produces two flowers, one at each side, which are joined to the parent plant by a very thin connection. The ripe seed vessel is consequently easily detached at this spot and can be carried away by the wind—a mode of dispersal unique among the nearly 400 species of the genus Mesembrianthemum. The plant was discovered in the Ceres Karoo by Capt. Edward Alston.—J. P. **Dalton**: An experimental modification of van der Waals's equation. The *a* of van der Waals's equation is considered to be a function of the temperature only, and the *b* to be independent of the temperature. The function is then determined for a typical normal substance (*iso*pentane) from the experimental isothermals, and it is shown that the law $\log a=\alpha+\beta T$ is accurately obeyed. The equation is modified accordingly. The new saturation constants are obtained, and the modified vapour pressure curve is found to represent experimental results for both normal and abnormal substances much more closely than the original. The new values agree well with the van der Waals vapour pressure formula, and the value of the constant at the critical point is practically equal to that which is given by carbonic acid and by *iso*pentane. The modified equation is also used with quite satisfactory results for the calculation of latent heats and also for obtaining the curve of inversion of the specific heat of saturated vapours.—J. R. **Sutton**: Barometric variability at Kimberley and elsewhere. An attempt to determine working constants which shall represent the "cylonic activity" at various places in South Africa and such other places outside as have available information regarding the barometer. Tables are given showing the monthly mean constants, with maximum and minimum values, or barometric variability. One deduction is that the "equinoctial gales," so far as barometric changes can represent them, have no existence in fact.

BOOKS RECEIVED.

Les Zoocécidies des Plantes d'Europe et du Bassin de la Méditerranée. By C. Houard. Tome Troisième. Supplément 1909–12. Nos. 6240 à 7556. Pp. 1249–1560. (Paris: A. Hermann et Fils.) 10 francs.

Die Stammesgeschichte der höheren Pflanzen. By Dr. W. Breitenbach. Pp. 77. (Brackwede i.W.: Dr. W. Breitenbach.) 1.50 marks.

Vergleichende Physiologie und Morphologie der Spinnentiere unter besonderer Berücksichtigung der Lebensweise. By Prof. F. Dahl. Erster Teil. Pp. vi+113. (Jena: G. Fischer.) 3.75 marks.

Handbuch der Vergleichenden Physiologie. Edited by H. Winterstein. Band iii. Erster Heft. (Jena: G. Fischer.) 5 marks.

Handwörterbuch der Naturwissenschaften. Edited by E. Korschelt and others. 62 and 63 Lief. (Jena: G. Fischer.) 2.50 marks each Lief.

The Romance of the Newfoundland Caribou. By A. A. Radclyffe Dugmore. Pp. viii+191+plates. (London: W. Heinemann.) 12*s*. 6*d*. net.

The Waters of the North-Eastern North Atlantic: Investigations Made During the Cruise of the *Frithjof*, of the Norwegian Royal Navy, in July, 1910. By F. Nansen. Pp. 139+xvii plates. (Leipzig: Dr. W. Klinkhardt.)

The Nummulosphere. By R. Kirkpatrick. Part 2. The Genesis of the Igneous Rocks and of Meteorites. Pp. xv+plate. (London: Lamley and Co.) 1*s*. net.

Principles and Methods of Teaching Geography. By F. L. Holtz. Pp. xii+359. (London: Macmillan and Co., Ltd.) 5*s*. net.

Practical Surveying and Elementary Geodesy. By Prof. H. Adams. Pp. xii+276. (London: Macmillan and Co., Ltd.) 4*s*. 6*d*.

Manures and Fertilizers. By Dr. H. J. Wheeler. Pp. xxi+389. (London: Macmillan and Co., Ltd.) 7*s*. net.

Lepidoptera Indica. By Col. C. Swinhoe. Part cxxii. Pp. 313–336+plates. part cxxiii. Pp. 337–364+x. (London: L. Reeve and Co., Ltd.) 10*s*. plain; 15*s*. coloured; and 15*s*. respectively.

Die Oekologie der Pflanzen. By Dr. O. Drude. Pp. x+308. (Braunschweig: F. Vieweg und Sohn.) 10 marks.

A National System of Education. By J. H. Whitehouse. Pp. 92. (Cambridge University Press.) 2s. 6d. net.

Smithsonian Miscellaneous Collections. Vol 61, No. 1, The White Rhinoceros. By E. Heller. Pp. 77+31 plates. (Washington: Smithsonian Institution.)

Annual Report of the Board of Regents of the Smithsonian Institution for the Year Ending June 30, 1912. Pp. xii+780+plates. (Washington: Government Printing Office.)

Text-Book of Paleontology. Edited by Prof. C. R. Eastman. Adapted from the German of Karl A. von Zittel. Second edition, revised and enlarged. Vol. i. Pp. x+839. (London: Macmillan and Co., Ltd.) 25s. net.

The Snakes of Europe. By Dr. G. A. Boulenger. Pp. xi+269+xiv plates. (London: Methuen and Co., Ltd.) 6s.

A First Numerical Trigonometry. By W. G. Borchardt and the Rev. A. D. Perrott. Pp. xi+159+xvii+xvii. (London: G. Bell and Sons, Ltd.) 2s. 6d.

Icones Orchidearum Austro-Africanarum Extra-Tropicarum; or, Figures, with Descriptions of Extra-Tropical South African Orchids. By H. Bolus. Vol. iii. Pp.+plates 1–100. (London: W. Wesley and Son.)

Die Atome. By Prof. J. Perrin. Mit Autorisation des Verfassers Deutsch herausgegeben von Dr. A. Lottermoser. Pp. xx+196. (Dresden and Leipzig: T. Steinkopff.) 5 marks

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 27.

ROYAL SOCIETY, at 4.30.—A Method of Measuring the Pressure Produced in the Detonation of High Explosives or by the Impact of Bullets: Prof. B. Hopkinson.—Gravitational Instability and the Nebular Hypothesis: J. H. Jeans.—The Diffraction of Light by Particles comparable with the Wave-length: B. A. Keen and Prof. A. W. Porter.—Note on the Colour of Zircons, and its Radio-active Origin: Prof. R. J. Strutt.—The Influence of the Constituents of the Crystal on the Form of the Spectrum in the X-ray Spectrometer: Prof. W. H. Bragg.—The Analysis of Crystals by the X-ray Spectrometer: W. L. Bragg.—Ship Resistance: The Wave-making Properties of Certain Travelling Pressure Disturbances: Dr. T. H. Havelock.—The Mathematical Representation of a Light Pulse: Dr. R. A. Houstoun.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Characteristics of Insulation Resistance: S. Evershed.

CONCRETE INSTITUTE, at 7.30.—The Differential and Integral Calculi for Structural Engineers: W. A. Green.

FRIDAY, NOVEMBER 28.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Patent Protection: A. Abbey.

PHYSICAL SOCIETY, at 5.—The Expansion of Silica: Prof. H. L. Callendar.—The Thermal Expansion of Mercury and Fused Silica: F. J. Harlow.—An Experimental Method for the Production of Vibrations on Strings, Prof. J. A. Fleming.—A Double-fibre String Galvanometer: W. Apthorpe.

SATURDAY, NOVEMBER 29.

ESSEX FIELD CLUB (at the Essex Museum of Natural History, Stratford) at 6.—Autumn Botany at Clacton: C. E. Britton.—Report of Club's Delegate at the Meeting of the British Association at Birmingham, 1913: J. Wilson.—A Demonstration on the Nano-Plankton of Freshwater Ponds and Lakes, as Revealed by the Use of the Centrifuge: D. J. Scourfield. The Occurrence of Rhaxella-chert in the Epping Forest Gravels: P. G. Thompson.—Notes on the Plant-seeds found during Excavation of the Romano-British Barrow on Mersea Island: S. Hazzledine Warren.

MONDAY, DECEMBER 1.

SOCIETY OF ENGINEERS, at 7.30.—The Corrosion and Rusting of Iron: E. K. Rideal.

ARISTOTELIAN SOCIETY, at 8.—Feeling: Prof. J. A. Smith.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Use of Antiseptics for Soil Sterilisation Purposes: Dr. E. J. Russell and Mr. Buddin.

ROYAL SOCIETY OF ARTS, at 8.—Cantor Lecture—The Measurement of Stresses in Materials and Structures: Prof. E. G. Coker.

TUESDAY, DECEMBER 2.

RÖNTGEN SOCIETY, at 8.15.—Sterilisation of Milk by Electrified Gas: Dr. Hampson, Prof. W. G. Duffield, and T. Murray.—Radium-emanation Applicators: C. E. S. Phillips

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—Japanese Minor Magic connected with the Propagation and Early Infancy of Children: W. L. Hildburgh.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Transandine Railway: B. H. Henderson.

WEDNESDAY, DECEMBER 3.

AËRONAUTICAL SOCIETY, at 8.30.—The Coming Airship: Captain C. M. Waterlow.

GEOLOGICAL SOCIETY, at 8.—(1) A Contribution to our Knowledge of the Geology of the Kent Coalfield; (2) The Fossil Floras of the Kent Coalfield: Dr. E. A. Newell Arber.

ROYAL SOCIETY OF ARTS, at 8.—Perfumery: J. C. Umney.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Sulphuretted Hydrogen from Artificial Graphite: W. H. Woodcock and B. Blount.—The Determination of Strychnine in the Presence of Quinine: C. Simmonds.—The Rate of Liberation of Hydrocyanic Acid from Linseed: S. Collins and H. Blair.—The Composition of Palm-Kernel Oil: G. D. Elsdon.

ENTOMOLOGICAL SOCIETY, at 8.—New South American Butterflies: W. F. H. Rosenberg and G. Talbot.

THURSDAY, DECEMBER 4.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: (1) A Method of Studying Transpiration; (2) The Effect of Light on the Transpiration of Leaves: Sir Francis Darwin.—Dimensions of Chromosomes considered in Relation to Phylogeny: Prof. J. B. Farmer and L. Digby.—The Process of Calcification in Enamel and Dentine: J. H. Mummery.—The Optimum Temperature of Salicin Hydrolysis by Enzyme Action is Independent of the Concentrations of Substrate and Enzyme: A. Compton.—The Ratio between Spindle Lengths in the Spermatocyte Metaphases of Heliae Pomatia: C. F. U. Meek.—Egyptian Blue: Dr. A. P. Laurie, W. F. P. McLintock and F. D. Miles.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Electricity Supply in Large Cities: Dr. G. Klingenberg.

LINNEAN SOCIETY, at 8.—Wild Wheat from Mount Hermon, *Triticum dicoccoides* Koern: Prof. J. Percival.—Neurotes, a New Genus of Mymaridæ, from Hastings: F. Enock.—A Contribution to the Study of the Evolution of the Flower; with Special Reference to the Hamamelidaceæ, Caprifoliaceæ and Cornaceæ: A. S. Horne.—The Mollusca of the River Nile: Mrs. Longstaff.

FRIDAY, DECEMBER 5.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Thomas Hawksley Lecture: Water as a Mechanical Agent: E. B. Ellington.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Presidential Address: Sir Boverton Redwood, Bart.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Liverpool Street Extension of the Central London Railway: H. V. Hutt.

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