THURSDAY, OCTOBER 27, 1910.

ANCIENT PLANTS.

Ancient Plants: being a Simple Account of the Past Vegetation of the Earth and of the Recent Important Discoveries made in this Realm of Nature Study. By Dr. Marie C. Stopes. Pp. viii+198, with 122 figures and frontispiece. (London: Blackie and Son, Ltd., 1910.) Price 4*s.* 6*d.* net.

FOSSIL botany, once the very type of a dry-as-dust subject, has attracted a good deal of attention of late years, and its more important discoveries and conclusions have become the common property of students of botany, at least in this country. Miss Stopes aims at interesting a wider class. "There is no book," she says, "in the English language which places this attractive subject before the non-specialist, and to do so is the aim of the present volume"; further on she adds that her book is dedicated "especially to all those who take an interest in plant evolution, because it forms a thread in the web of life whose design they wish to trace."

The author is well qualified for her work, and has attained a considerable measure of success. Her style is interesting, and if sometimes a little careless, that is, after all, a minor point. Miss Stopes is somewhat severe on her predecessors, of whose work she speaks thus: "But, like the records left by the plants themselves, most of this literature is unreadable by any but specialists, and its really vital interest is enclosed in a petrifying medium of technicalities" (p. 2). Her object is to make these dry bones live, but it has been tried before.

The chapters on the various kinds of fossil plants and on coal are very well done, especially the account of coal-balls, those calcareous nodules which contain the wonderful structural specimens on which our knowledge of coal-plants so much depends. On this subject the author is a leading authority.

The "Seven Ages of Plant Life" (chap. iv.) range from the archæan to the present day; the sacred number seven may have a charm for some; otherwise we should have thought a shorter list would have been more useful; there are only four really important periods to be distinguished in the history of plants as known at present. The chapter on stages in plant evolution is wisely kept quite elementary, any general discussion of the evolution of the various groups being necessarily postponed until all have been studied. The assumption that life is "endowed with a continuous impulse to advance" (p. 43) will strike the Darwinian reader as unduly mystical.

The diagrams and curt descriptions of cells and tissues of recent plants given in chap. vi. will scarcely help the general reader very much; unless he has had more training in botany than this, he had better leave the anatomy of fossil plants alone. The truth is that fossil botany, if it is to include structure, is *not* a subject for a beginner. Those, however, who have done some laboratory work before may find this outline of anatomy of some service by way of recapitulation.

Ten chapters are devoted to the past histories of plant families, and form the main division of the book. It is impossible to follow these chapters in detail; on the whole, they give a very good sketch of some of the chief results of modern research, but their merits will be best appreciated by those who have some previous knowledge. The author has some incisive remarks on the modern theory of the origin of Angiosperms from Cycadophyta, allied to the Bennettitales; she says: "We must not forget that the Bennettitales have only recently been realised fully by botanists, and that a new toy is ever particularly charming, a new cure particularly efficacious, and a new theory all-persuasive" (p. 103). This is quite a fair hit, but the next paragraph is less happy. In criticising the supposed primitive position of the Ranales among Angiosperms, the author states that they are most frequently delicate herbs, and that they are peculiarly remote from the group of Bennettitales in their vegetative structure. Really it is the shrubby Magnoliaceæ which chiefly come into the question; in the structure of the wood some of these plants are more like Gymnosperms than any other of the Dicotyledons.

The concluding chapter, which includes an ingenious attempt to forecast the future course of plant-evolution, is very interesting. It is perhaps a pity that in the space of about one page the author tries to give an idea of the mutation theory as opposed to pure Darwinism. An altogether misleading idea of Darwin's position is given, and the whole question would have been better omitted in a book for beginners.

In the appendices some hints on the collection of fossil plants are given, followed by a short bibliography. It is rather hard on Mr. Kidston that he is only represented by his British Museum catalogue of 1886, a list which he would certainly regard as now out of date. The book concludes with a glossary of some botanical and geological terms.

Most of the illustrations are good and useful; a few, especially some of those from photographs, are less clear than is desirable in an elementary book.

Although, as we have seen, there are some points open to criticism, Miss Stopes's book is an enterprising and able attempt to popularise a difficult subject. The really keen student will undoubtedly be stimulated to pursue the study of fossil plants further, and even those who are not students will get some new ideas and derive a certain amount of interest from a book which is sometimes brilliant and never dull.

D. H. S.

BRITISH RAINFALL.

British Rainfall, 1909. By Dr. Hugh Robert Mill. Pp. 120+308. With maps and illustrations. (London: Edward Stanford, 1910.) Price 10*s.*

THIS volume is the forty-ninth of the series, and the largest hitherto issued, but the price remains the same as when it was a quarter of the size. The value of the work of the British Rainfall Organisation in all questions in which an accurate knowledge of the rainfall is essential has been acknowledged on

all sides, and has frequently been referred to in our columns. Owing to the continual growth of the work, the director, who for many years has received no financial help except from the observers themselves and a few subscribers interested in the subject, has in recent years had to meet a considerable deficit. In order to ensure the undertaking "from the risks of mortality," he has made over the unique collection of documents and his interest in the concern to a strong representative body of trustees, who have formed an endowment fund, while Dr. Mill will continue to act as director, as before; this arrangement was referred to in our issue of June 16.

Part i. includes an interesting article by Mr. Gethin Jones on the snowfall of the Snowdonian range; one of the photographs shows a large patch of snow lying on June 29 last; also a discussion of the duration of rainfall in 1909 by the editor. In part ii., eighty pages are occupied by observers' remarks; the director has hinted elsewhere that the space might be more serviceable for printing additional monthly values. In addition to the usual tables, interesting chapters are devoted to the discussion of heavy rains in short periods and on rainfall days, with maps illustrating some of the greatest falls. There are also maps showing (1) the amount of rainfall and (2) percentage of average, with a short discussion, for each month. For the British Isles, as a whole, the rainfall of the year (38·56 inches) was exactly the average; but during the last twenty-one years dry years have been more than twice as frequent as wet ones. Reference is made in the report to a crusade against entering the rainfall to the wrong day. This is most important, and, unless one rule is adhered to, accurate maps of monthly rainfall cannot be drawn. But, notwithstanding the efforts of meteorological conferences to ensure uniformity, differences do still exist in some of the best foreign services. To take only one case, the Austrian "Instructions" (1905, p. 17) correctly direct that, even when known to have fallen in the early morning, the amount should be entered to the previous day, while the Norwegian "Year Book" (1909, p. ix) says the rainfall measured in the morning is entered to the preceding day, except when it is known for certain that it fell after midnight.

INDIAN CRUSTACEA.

Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. By Lt.-Col. A. Alcock, F.R.S. Part i., Brachyura. Fasciculus i., Introduction and Dromides or Dromiacea (Brachyura Primigenia). 1901. Pp ix+80+viii plates. Price 7 rupees. Fasciculus ii., The Indian Fresh-water Crabs—Potamonidæ. 1910. Pp. iv+135+xiv plates. Price 14 rupees. (Calcutta.)

THE "Catalogue of the Indian Decapod Crustacea," which is in course of publication by the Trustees of the Indian Museum, Calcutta, consists of a series of independent fascicles, each complete in itself, and forming a systematic monograph of the Indian species in the group with which it deals. The two parts under notice relate to the Brachyura. The first, published nine years ago, contains a general introduction to the series giving an outline of the morphology of the Decapoda, so far as it is necessary for systematic purposes, and describing as a type *Nephrops andamanica*, a form closely resembling the Norway lobster of our own coasts. This is followed by a statement of the characters distinguishing the Brachyura or true crabs, and a sketch, all too short, of their bionomics, with special reference to the Indian species, prefacing a systematic account of those belonging to the Tribe Dromiacea. This tribe is of special interest on account of the very primitive character of some of its members, which enable the origin of the Brachyura to be traced back, as Bouvier showed, to the lobster-like Nephropsidea. Many important types were captured by the *Investigator* in the Bay of Bengal, and are fully described and figured in this fascicle.

The group of Brachyura dealt with in the second fascicle is also of special interest, although for very different reasons. The river-crabs of the family Potamonidae (formerly known as Telphusidae) are found in fresh waters throughout the tropical regions of the world. Their geographical distribution has been especially studied by Dr. A. E. Ortmann, who used it in his ingenious speculations regarding the former distribution of land and water on the surface of the globe. The geographical relations of any group of organisms, however, can only be studied with profit when their systematic relations have been determined with some degree of certainty, and it happens that the river-crabs, like many other groups of fresh-water animals, present special difficulties to the systematist. There has hitherto been no general agreement with regard to the limits, not only of species and varieties, but even of genera and subfamilies, and the very valuable monograph of the family recently published by Miss M. J. Rathbun in the Archives of the Paris Museum, while immensely lightening the task of subsequent workers, made very obvious the unsatisfactory character of much of our knowledge of the group. Lt.-Col. Alcock now directs attention to certain structural characters, hitherto for the most part overlooked, which enable the species to be grouped in well-defined categories, and he proposes an entirely new classification, in which species hitherto placed side by side in the same subgenus are widely separated in distinct subfamilies. The application of this classification to the river-crabs inhabiting other regions is only hinted at in this memoir, but there can be no doubt that it will greatly modify our conceptions of their geographical relations.

In the power of terse and lucid description, in the acute perception of systematic affinities, and in the breadth of view derived from a familiarity with many diverse groups of the animal kingdom, Lt.-Col. Alcock has few equals among living carcinologists, and it is a matter for congratulation that his retirement from the post of superintendent of the Indian Museum has not terminated the long series of important memoirs on the Indian fauna which we owe to his pen. W. T. C.

NATURALISTS' NOTES FROM THE OLD SPANISH MAIN.

Our Search for a Wilderness. An account of two ornithological expeditions to Venezuela and to British Guiana. By Mary Blair Beebe and C. William Beebe. Pp. xix+408. (New York: Henry Holt and Co.; London: Constable and Co., Ltd., 1910.) Price 10*s.* 6*d.* net.

A FEW years ago the authors wrote a pleasant little book, "Two Bird-lovers in Mexico." The present "Search for a Wilderness" did not prove difficult, because they found one in the mangrove swamps on the old Spanish main, opposite the island of Trinidad. They hired a little sloop, and cruised about on the San Juan river, which falls into the Gulf of Parian. The mud-flats teemed with life, and after nightfall arose the many quaint and mysterious sounds of the tropical jungle. For one of these sounds, a muffled choking, they found an unexpectedly simple explanation. The anaconda makes its lair in a hole in the bank at the waters' edge. When the rising or falling tide laps into or out of the vacated mudhole, a big bubble of air frees itself with a sudden gasping sob. Further up the river they visited La Brea, the strange lake of pitch in the midst of a region of primeval forest.

Whilst on this visit to Venezuela the collecting of birds was incidental; they went in the spring of 1909 to British Guiana, accompanied by an assistant, to collect birds in earnest; but Mr. Beebe is certainly not a destructive ornithologist. His party killed only about one hundred specimens, and these because of some special interest, and there occurs the following passage which deserves quoting. "We were glad to find that the most difficult privilege to obtain is a permit to collect birds, and the very stringent laws in this respect are an honour to the Governor (Sir Frederick Hodgson, K.C.M.G.), and his colonial officials. Thanks to the absence of the plume and general milliner hunter, the game hog, and the wholesale collector, birds are abundant and tame."

From Georgetown as their centre they made several trips. Hospitably entertained, and being spared all the usual annoyances of transportation, they visited, by launch, the Hoorie gold mines in the north-western corner of the colony, an excellent place for studying the ways of its wild inhabitants. Thence they made their way back to the capital, threading little-known rivers and creeks in a canoe, and for five days they were paddled, portaged, towed, and pushed through a wonderland abounding in beautiful birds, butterflies, and orchids, and they were made welcome for the night at little isolated Indian missions.

Next followed a trip up the Essequibo and one of its tributaries to the Aremu mine. In these waters they saw the little freshwater flying fish, *Carnegiella spigatus,* which, however, "did not leave the surface entirely, but skimmed steadily along in a straight line, with the tip of the deep keel of the abdomen just cutting the surface." The travellers were keen and lucky enough to make many interesting observations, which they have recorded in a pleasantly easy style, illustrated with numerous good photographs of scenery and scenes of many creatures, from man to insects. A narrative sparkling with incidents needs no froth like the following:—"Most curious of all were the Loricates or armoured catfish, with a double row of large overlapping scales enclosing their body from head to tail. Like the Hoatzin among the birds, these fish are strange relics of the past, preserved almost unchanged from the ancient fossil Devonian fauna." Relics of the past, by all means, but what have the Siluroid Teleostean fishes to do with the Devonian epoch?

A visit to the savannahs and lagoons of the Abary river, with its abundance of bird life, for instance, large colonies of the quaint Hoatzin, was cut short by a broken wrist suffered by the lady. We wish them many more such pleasant trips, and may they not be undeceived in their optimistic opinion as to "the falsity of most of the universal slanders on a tropical climate."

GRAPHICAL CHEMISTRY.

Leitfaden der graphischen Chemie. By Dr. R. Kremann. Pp. 36+5 modelle. (Berlin: Verlag von Gebrüder Borntraeger, 1910.) Price 6.60 marks.

IN view of the importance of a knowledge of the equilibrium relationships which are involved when two or more substances are brought together in different quantities under different conditions of temperature and pressure, and of the rapid progress which has been made in recent years in the study of more complicated cases of such equilibria, it is essential that the student of physical chemistry should be familiar with the various methods which are used for the graphic representation of experimental results.

There can be no doubt that the interpretation of the space models, which are employed with great advantage to depict the equilibrium relationships of ternary and quaternary systems, offer considerable difficulties to those who are not familiar with the subject. This is the author's experience, and the issue of a series of five adjustable cardboard models, with an explanatory guide, is intended to facilitate the acquirement of a knowledge of the rudiments of graphical chemistry.

The cardboard models, which are made to scale from experimental data, represent respectively the equilibrium relationships in the following systems—(1) Silver nitrate and water (2) potassium sulphide, magnesium sulphate and water (3) tin, lead and bismuth (4) ammonium nitrate, water, methyl alcohol and ethyl alcohol (5) water and the reciprocal pairs of salts —sodium chloride + ammonium hydrogen carbonate $\rightleftharpoons$ ammonium chloride + sodium hydrogen carbonate.

These systems afford sufficient material for an exposition of the various modes of graphic representation, but it is very doubtful whether prepared models of this character can be of much service to the student whose aim is thoroughly to understand the connection between the space models and the actual experimental data. In the reviewer's opinion the requisite

familiarity can only be obtained when these data are directly utilised by the student in the actual construction of equilibrium models. This demands the expenditure of considerable time, but the results obtained are incomparably better than those which follow from the manipulation of prepared models. On the other hand, the cardboard models are to be preferred to the plane projections which form the usual text-book method of graphic representation. From this point of view the series of models may be found to be useful, anl would have been more so if the explanatory matter in the accompanying text had been considerably extended.

AMATEUR ASTRONOMY.

The Amateur Astronomer. By Gideon Riegler. Translated by G. A. Clarke. Pp. 319, with 112 illustrations. (London: T. Fisher Unwin, 1910.) Price 3*s.* 6*d.* net.

DESPITE the host of astronomy books which has appeared in recent years, there may be room for a well-written, concise guide-book for the beginner in practical work; but, even if there is, we fear that the volume under review does not fill it adequately.

The author first deals with the questions of site, instruments, books, &c., and then proceeds to give a series of notes on the characteristics of the individual objects observable with a modest equipment. Thus the constellations are taken, and the peculiarities of selected individual stars described. Then the same form of treatment is given to double-stars, star-clusters and nebulæ, and variable stars, followed by a chapter describing solar features. In the chapter on the moon, which comes next, a large number of individual craters, plains, &c., are described, but, in the absence of a complete map, the beginner will find, despite the inclusion of undefined latitude and longitude, that some of the smaller features figured are not easy to locate. Chapters on the planets, comets, and meteorites and shooting stars complete the tale.

The general scheme of the work is not unattractive, but grave faults mar its execution. Simple points are treated discursively, whilst more difficult ones, on which the amateur should have clear, if elementary, information, are passed over with one or two imposing terms. An example or two will serve to show that it would have been better to omit many items altogether; dogmatic statements may convince the beginner, but the greatest care should be taken to convince him rightly.

For example, oxygen and cadmium (p. 154) are *not* exceptionally prominent elements in the sun, and certainly do not provide the crucial difference between its spectrum and that of Aldebaran; nor is mercury an outstanding feature of the latter. But worse follows, for we are informed that, while hydrogen is not represented in the spectrum of Betelgeuse, thallium is such a prominent feature "that its lines stand out quite plainly, *in spite of the great distance of the star*"; the italics are ours. There are only two or three pages of spectroscopical details, but it is a great pity that they were ever published.

Other matters, apart from spectroscopy, could be quoted to the same effect, but the above will probably suffice to show that the book is marred by serious faults, dangerous for the beginner.

It only remains to add that the work often bears the impress of translation; long and involved sentences are not uncommon, and such inversions as "6 magnitude," "4·5 magnitude," used almost throughout, are annoying.

W. E. ROLSTON.

OUR BOOK SHELF.

A Guide for Medicine and Surgery, compiled for Nurses. A Handbook for Nurses. By Sydney Welham. Pp. ix+230. (London: Mills and Boon, Ltd., 1910.) Price 3*s.* 6*d.* net.

IN order to do their work satisfactorily, nurses require some knowledge of the principles of medicine and surgery. This is fully recognised in every modern hospital, and due provision is made for instruction of the nursing staff in the elements of anatomy, physiology, pathology, medicine, and surgery. Courses of lectures on these subjects are arranged and the nurses are encouraged to supplement lectures by reading. There is no doubt that a small handbook, such as the volume under review, will be found very useful for purposes of reference, although it makes no attempt to replace the recognised text-books. The style is simple and direct, the type is clear, the index is admirable, while a glossary of medical terms, a list of Latin phrases commonly used in prescriptions, with many other practical tables, diet scales, recipes, &c., greatly enhance the value of the book. It is eminently practical and convenient.

It would be ungracious to criticise a small volume which deals with every branch of medicine in 230 pages on the ground that it did not contain original matter. It succeeds in giving a great deal of information, and the views expressed are in accordance with modern thought. In a short preface the author disclaims any attempt to teach nursing, but, nevertheless, many of his hints will be useful even to nurses of considerable experience, while it will be of real value to young probationers. It will help them to understand the cases that come under their care, it will enable them to follow clinical instruction in the wards, and it will serve as a handbook on which they can rely for assistance in practical emergencies, and also when they are preparing themselves for examinations.

The Death-dealing Insects and their Story. By C. Conyers Morrell. (Manchester: H.A.W. Offices, 7 Brazenose Street, 1910.) Price 1*s.* net.

THIS little book is one of the many which have been recently published for the purpose of instructing the laity regarding recent discoveries in connection with insects and disease. It is one of the best of them, and possesses a good style without being too diffuse. The connection of mosquitoes, tsetse-flies, ticks, and fleas with malaria, elephantiasis, sleeping-sickness, tick fever, and plague are described in a manner which will appeal to laymen. We miss the name of Bruce in connection with trypanosomiasis, and though the excellent Campagna experiment of 1900 was useful for advertisement, it can really scarcely be cited as conclusive proof of the mosquito theory of malaria.

The author seems to be rather optimistic as to the results of sanitation in West Africa, regarding

which little genuine evidence is forthcoming. He is wise in not paying too much attention to the numerous scientific "Mother Shiptons," who have so frequently attempted to gain credit for discoveries on the strength only of their prophecies. But the book can safely be recommended to such of our lay friends as meditate living in the tropics. R. R.

Abhandlungen Jean Rey's, über die Ursache der Gewichtszunahme von Zinn und Blei beim Verkalken. Deutsch herausgegeben und mit Anmerkungen versehen. By Ernst Ichenhäuser and Max Speter. Pp. 56. (Leipzig: W. Engelmann, 1909.) Price 1.20 marks.

JEAN REY'S "Essais sur la recherche de la cause par la quelle l'estain et le plomb augmentent de poids, quand on les calcine" have been familiar to English readers for some years past, through the valuable agency of the Alembic Club, which has issued an English translation as one of their series of reprints. The present German translation is published as No. 172 of Ostwald's Klassiker der Exakten Wissenschaften. The essays, written in 1630, contain a remarkable discussion on an increase in weight which had been observed, by an apothecary at Bergerac named Brun, to take place during the calcination of metallic tin in an iron vessel. The conclusion, arrived at by argument rather than discussion, that the gain in weight was due to the condensation of air, was a remarkable anticipation of views that were not generally accepted until the time of Lavoisier, 140 years later. The German reprint is provided with a valuable series of notes dealing with the history of the essays and with various points requiring elucidation in the essays themselves.

Elementary Regional Geography. Great Britain and Ireland. By J. B. Reynolds. Pp. viii+184. (London: A. and C. Black, 1910.) Price 1*s.* 4*d.*

Cambridge County Geographies. Nottinghamshire. By Dr. H. H. Swinnerton. Pp. xi+153. *Lanarkshire.* By Frederick Mort. Pp. viii+168. (Cambridge: University Press, 1910.) Price 1*s.* 6*d.* each.

MISS REYNOLDS has written an interesting and easy account of the geography of the British Isles which will be useful as an introduction to the subject. A few practical exercises for young pupils to work have been introduced; but the book would have been more valuable had this aspect of the teaching been more prominent. The excellent illustrations will certainly secure the attention of juvenile readers.

A very broad view of geography is taken by the writers of the latest additions to the "Cambridge County Geographies." Space is found by each author, in a slight treatment of a large subject, for sections on antiquities, ecclesiastical, military, and domestic architecture, and on the history of the county. Both volumes are well up to the high standard reached by other books in the series.

The Cambridge Pocket Diary for the Academical Year 1910–11. Pp. xv+255. (Cambridge: University Press.) Price 1*s.* net.

BOTH the staffs and students of schools and colleges will find this pocket diary very convenient. Beginning with September 20, 1910, and extending to September 30, 1911, it covers every length of academic year, and will be useful in all educational centres. Besides this interval of time, for which full space is given, several pages are devoted to the weeks until the end of 1911, so that important engagements for the early part of the succeeding professional year can be booked. The diary also contains a useful miscellany of general information.

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.*]

The Biological Laboratories at Woods Hole.

I HAVE noted with interest a recent discussion in NATURE of August 25 and September 15 and 29 in which the biological laboratories at Woods Hole have received incidental mention. I pray that you may give me this opportunity to correct some very prevalent misconceptions regarding the status of the Government station there. In NATURE of September 15 Prof. MacBride has voiced some of these misconceptions very clearly. "It is true," he writes, "that there are *two* stations in Woods Hole, one supported by the Federal Government and devoted entirely to economic work, and the other supported entirely by zoologists; but the station which has attained world-wide fame, owing to the quantity and quality of the research which has issued from it, is the second and purely scientific one" (pp. 330, 331).

Now, although Prof. Herdman has pointed out in two letters the misleading character of these statements, it appears that Prof. MacBride is "of the same opinion still," for in your issue of September 29 he avers:—"That valuable scientific work of general interest occasionally issues from the laboratory of the U.S. Bureau of Fisheries, which was founded and is maintained for research on economic lines, is totally irrelevant" (p. 396).

What the United States Fish Commission[1] laboratory at Woods Hole was originally founded for may best be gathered from a perusal of the earlier annual reports of the first commissioner, the naturalist Spencer F. Baird. He emphasises more than once the futility of attempting to deal broadly with fisheries problems without an intelligent understanding, not only of marine life as a whole, but of all the various physical and chemical factors which may affect this. (See especially first report of the commissioner, p. xiii.)

The whole history of the United States Fish Commission, and of the Woods Hole station in particular, bear abundant testimony to the sincerity of this broad-minded attitude of its founder. The pioneer faunistic work of Verrill and his colleagues in the 'seventies and 'eighties was carried out very largely under the auspices of the National Fish Commission, and Woods Hole was the chief headquarters from which these explorations were conducted. Furthermore, one need only refer to the past reports of the commission to find in the list of those who have worked at the Woods Hole station many of the most prominent names in American biology. Here we meet, for example, with the names of Farlow and Gill, of E. B. and H. V. Wilson, of Morgan, Bumpus, Andrews and Eigenmann, to say nothing of Brooks and Ryder, who have passed away. These men were not, for the most part, engaged upon "economic" problems in any strict sense of the word. And in more recent years some of the physiological work of G. H. Parker, C. J. Herrick, W. B. Cannon, E. P. Lyon and others, has been conducted in the Fish Commission laboratory, as well as the taxonomic work of such men as Edwin Linton, C. W. Hargitt, C. C. Nutting, W. M. Wheeler, H. L. Clark, and C. B. Wilson.

I regret that anything like a defence of the scientific status of the Fisheries Laboratory has been necessary in these columns, for the facts here stated are well known to every American zoologist who is familiar with conditions at Woods Hole. But unfortunately all zoologists, even in America, are *not* familiar with the conditions at Woods Hole, and the misconceptions voiced by Prof. MacBride are still held tenaciously in certain quarters.

As Prof. Herdman has pointed out, there are two scientific laboratories at Woods Hole. But conditions are even more complicated than this, for the Bureau of Fisheries itself maintains two more or less independent institutions there. One is the biological laboratory, maintained by

[1] Changed in 1903 to the Bureau of Fisheries of the Department of Commerce and Labour.

the Bureau's "Division of Scientific Inquiry," the other the hatching station, maintained by the "Division of Fish Culture." These two establishments are under different heads, and are, so far as possible, independent of one another, though they to a large extent share the same buildings. The biological laboratory, in the general scope of its work, does not differ widely from the other leading marine laboratories of the world. It is true that greater emphasis is laid upon the economic aspect of marine biology, and a number of investigators are each year employed by the Bureau to conduct researches upon such subjects as the food value and chemical composition of marine organisms, or upon problems directly related to the natural history of food fishes; but to say that investigations are restricted to such lines is to do great violence to the facts. The Bureau has always put a liberal construction upon the word "practical," realising that no hard-and-fast line should be drawn between pure and applied science, and regarding all information as ultimately useful which gives us a deeper insight into the life of the sea.

The two biological laboratories at Woods Hole—the "Marine Biological Laboratory" and that of the Bureau of Fisheries—have worked together side by side since the establishment of the former in 1888. The choice of its name by the privately supported institution has—unintentionally, of course—been the source of much of the misapprehension of which I am speaking. The name, "*The* Marine Biological Laboratory," would seem to imply an exclusive occupancy of this field, whereas the United States Fish Commission was conducting biological work at Woods Hole as early as 1871, and its present laboratory building was erected in 1885.

Another source of misconception is the fact that the Fisheries Laboratory has no definite organ of publication. Its scientific results, so far as they are economic or faunistic, or in any way related to the natural history of the sea, are in a large measure published in the Bulletin of the Bureau of Fisheries. The results in other fields of work are embodied in papers—and the number of these is great—scattered through all our various biological journals in this country and abroad. On the other hand there exists the "Biological Bulletin," which is the official organ of the Marine Biological Laboratory, though it also accepts contributions from workers in all parts of our country, oftentimes including those in the Fisheries Laboratory at Woods Hole. It is needless to add that the Marine Biological Laboratory does not make the least pretence that this journal represents its own output in any exclusive sense.

But, after all, the main source of confusion relative to the two laboratories at Woods Hole is the fact that the biologists there form a single scientific community, the members of which mingle freely together without regard to their place of work. In fact, the same investigator may work one year in one laboratory, the next year in the other, or he may even hold tables in both simultaneously; and so the reading public lumps together all our productions as Woods Hole work, and draws no fine distinctions. In the circumstances, it is natural that the laboratory which bears the name of "*The* Marine Biological Laboratory" should be frequently credited with the entire output. This is written in no spirit of resentment, but merely as an explanation of the prevalence of this widespread misconception of the situation at Woods Hole.

It will be cheerfully granted that the "Marine Biological Laboratory" accommodates a much larger number of investigators—perhaps twice as many, on the average—as does its sister institution; and it is not likely that anyone connected with either laboratory fails to recognise that a considerably greater output of scientific results must at present be credited to the former. On the other hand, the Government laboratory had, until recently, the only really efficient steam vessels available for scientific research, and has had other decided advantages in its physical equipment. But we at Woods Hole waste little time in idle comparisons such as these. Most of us are too busy endeavouring to make an occasional contribution to our common science.

Whether or not the two laboratories will continue to cover so largely the same field of activity it remains for the future to decide. These are some good arguments for a greater division of labour than at present exists.

FRANCIS B. SUMNER.
(Director, Biological Laboratory of the U.S. Bureau of Fisheries at Woods Hole, Mass.)

Washington, D.C., October 12.

The Cocos-Keeling Atoll.

I CONSIDER myself fortunate that the author of the review of "Coral and Atolls," which appeared in NATURE of October 6, has addressed two direct questions to me, for in the answering of these questions it may be possible to open in a more frank manner the discussion of those problems with which I have dealt, and which are to be solved by dispassionate argument and investigation rather than by anonymous destructive criticism.

The first question which the reviewer puts to me is couched in the following form: he rightly asserts that I assume the lagoon of an atoll to be a slightly submerged reef, and then he asks, "Why this assumption without evidence?" For answer I would point out that the evidence is given freely in the work which he reviews (notably at pp. 251–2, and elsewhere), and, since he has apparently overlooked it, I will repeat that it consists, among other things, of the fact that submerged atoll-shaped reefs, and reefs also atoll-shaped, but of which some portion of the outer rim is awash, or on which some island débris is piled, are well-known geographical facts. The central part of the submerged reef forms the lagoon of the developed atoll, which is therefore not inaptly described as a "slightly submerged reef."

His second question is in connection with the mode of formation of atolls from the disintegration of high oceanic islands surrounded by a barrier reef. He asks me how I would explain "Agassiz's wonderful series of photographs of Fijian islands within barrier reefs" when I state that "the picture of the high island towards the completion of the process, when, after having stood resisting in a troubled sea, it so conveniently crumbles to pieces within the calm of an encircling barrier reef, appears to me to be contrary to all natural laws." I would give as explanation the very obvious suggestion that the formations illustrated (I presume in Bull. Mus. Comp. Zool. Harv., vol. xxxiii.) are not the outcome of the development of the barrier reef, for similar conditions are found, quite apart from any coral structures, all over the world, the coast-lines of islands in northern seas providing equally good examples.

It may perhaps be permissible to extend this reply so as to embrace the answers to some assertions of the reviewer regarding corals and coral islands, and to point out some misquotations from the work under discussion and some misconceptions of its conclusions.

The variability of the growth forms of corals is one of the problems discussed, and I have urged that sediment—as a factor of the environment—is a potent cause of modified coral growth. That the environment as a whole, and not merely the presence of silt, was considered, may be gleaned from the discussion of the growth of young colonies of Pocillopora (p. 100).

The reviewer turns from this to observe that the variability of corals "may aptly be compared to the growth shown by our forest trees in different environments. Reef corals, too, resemble trees in that they are largely dependent for their food on chlorophyll, which is present in minute algæ living in their digestive cavities. The coloration of most reef corals is largely due to these algæ, and their mode of growth is sympathetic to them in that the coral skeleton is deposited so as to expose the polyps to the maximum amount of light." The reviewer then adds, "Such appear to us the ordinary views of zoologists."

The only logical meaning that I can attach to this is that zoologists as a class ordinarily believe that the variability of the growth forms of corals—and of forest trees—is due to the fact that they contain chlorophyll in their tissues. That zoologists as a class would subscribe to this thesis appears to me unlikely, and the reviewer has yet

to explain the variability of those corals which, as is well known, possess no symbiotic algæ.

It would seem almost unnecessary to point out to one who criticises this work as being "in no way scientific" that the argument that, because forest trees are largely dependent on chlorophyll for their food, and corals are also largely dependent on chlorophyll for their food, therefore the reactions of forest trees and corals to varying environments will be similar, is not strictly scientific either. That the final test of specific form of corals must be the characters of the zooid is a fact on which I have insisted throughout, and the similarity of zooids in dissimilar forms is a fact that I have noted, although the reviewer appears to have entirely overlooked it.

That Wayland Vaughan found no difficulty in transplanting corals does not surprise me, for many others (myself among them) have also experienced no difficulty in the mere transplantation—any more than in the mere transplantation of "forest trees"; the difficulty only comes in (as is expressly pointed out, p. 123) when the coral is transplanted to an environment in which its growth-type, developed in a different environment, is unsuitable. In the experiments described I have pointed this fact out, and dwelt especially on cases of removing corals from a rough-water environment to a place where still water and the deposition of sediment were the prevailing conditions. In doing these experiments I was unconsciously repeating those previously carried out by Ehrenberg. Darwin (quoting from Ehrenberg's "Uber die Natur," p. 49) states that "where there is much sediment placed so as to be liable to be moved by the waves, there is little or no coral: and a collection of living specimens placed by him on a sandy shore died in the course of a few days" ("Coral Reefs," p. 89).

To pass to another section of the article, the reviewer correctly says that I describe the encircling reef as "a mosaic inlay of coral fragments cemented together into a solid platform," and then adds, "*but there is no evidence that it was ever really examined*"! Apart from the ungenerous suggestion that in a fifteen months' investigation of the atoll the encircling reef was never really examined, and that the author drew on his imagination or on previous descriptions for what lay for ever open to his inspection, is the gross oversight that a chapter is devoted to this feature, that its structure and formation are described (pp. 163, 254, &c.), and illustrated at Plate xiii., which shows a fractured surface of the "mosaic inlay." Had the reviewer genuinely thought that the encircling reef was never examined he was over-generous in describing me as "a painstaking naturalist"; if he did not entertain this thought, then he did ill in embodying this remark in his article. It is obvious that in places the reviewer has failed to grasp the meaning of the text which he would criticise, and, in speaking of the encircling reef, he charges me with drawing deductions from "a similar platform . . . found at 13 feet above mean tide-level." I presume that this charge is based on the statement at p. 283, that "where these steps are evident, the *island rise* is 13 feet above mean tide-level." The "island rise" is explained (and figured at Plate xiv.) as the rise of débris piled on the breccia platform, and in the sentence immediately preceding that quoted it is definitely said that the "steps of breccia rise one above the other to a total number of three or four, and to a height of almost as many feet." What is actually found, and what the description would appear to clearly depict, is a portion of breccia platform elevated to a height of something less than 4 feet, surmounted by a pile of débris reaching to a total height of 13 feet. What ambiguity might be imputed to the text should have been removed by one glance at Plate xv., which was specially included to depict the condition. I would point out to the reviewer that had intact breccia platforms been found at 13 feet above mean tide-level more dogmatic statements concerning probable elevation might have been made.

The reviewer has not only laid himself open to the charge of having failed to survey with accuracy the material he criticises, but he has also slipped into misquotations. Concerning the base on which coral structures are built, he cites me as saying that "it matters not what the base may be so long as its platform comes within the *wind-stirred* area." This area (above the limiting line of sedimentation) is, in the passage misquoted (p. 246), and consistently throughout, called the *wave-stirred* area. The two things may appear identical to the reviewer, but I think that his failure to grasp the difference diminishes the value of his criticisms upon the point.

F. WOOD-JONES.

St. Thomas's Hospital Medical School.

I HAVE not a copy of Mr. Wood-Jones's work before me, but I regret misquoting him with regard to the *wave-stirred* (not *wind-stirred*) area; I still desire more information on *the limiting line of sedimentation*.

Readers of NATURE must decide how much scientific evidence is given that the lagoon of an atoll is a slightly submerged reef. Perhaps I misunderstand the term "slightly submerged reef." I do not regard the lagoon in an atoll, which was formed, as Darwin suggested, by subsidence, as covering a reef at all. I do not think the borings in the lagoon at Funafuti suggest a reef such as surrounds a lagoon, and I do not consider that the nature of the rock under atoll lagoons is or can be settled without borings. Some evidence was doubtless obtained by Mr. Wood-Jones by dredgings, &c., as his book shows he has as thoroughly examined his atoll as he was able, but I do not regard the existence of atolls and atoll-shaped reefs elsewhere as more than indirect evidence of that which exists at Cocos-Keeling.

In Fiji there are many elevated islands. Some of these have fringing and others barrier reefs, which superficially appear to be of the ordinary coral-reef type. Such reefs cannot have existed when the islands were first elevated, and it seems to me that Agassiz's photographs show that high islands do crumble to pieces within the calm of encircling barrier reefs. This process would certainly be *convenient* for the formation of fringing and barrier reefs round these islands if organisms exist there which prevent the processes of disintegration from extending below the water-line over certain areas around them. In any case, it seems to me certain that islands within barrier reefs are being removed by some agency or other, and that the resulting reefs would simulate atolls.

So far as I can find out in the Madreporaria, the extraordinary variability in growth form has only been described in reef-builders which possess, in some form or other, chlorophyll in their tissues. I do not think my paragraph on the subject will be misunderstood by your readers. I adhere to my statement that "our author does not appear to have examined the zooids to see whether he is really dealing in any genus with one or more species," and leave this question to be settled by your readers.

Of course, the encircling reef was *really* (or genuinely) examined, and with considerable care, but I certainly did not consider, from Mr. Wood-Jones's work, that there was internal evidence that he had *sufficiently closely* examined it. I cannot follow all Mr. Wood-Jones's paragraph, but I quite fail to see where I have charged him with drawing deductions as to the encircling reef from "a similar platform found at 13 feet above mean tide-level." It would perhaps have been better if I had not used the word *similar*.

THE REVIEWER.

Early Burial Customs in Egypt.

IN his letter to NATURE of October 20 (p. 494) Prof. Flinders Petrie says:—"The whole question lies in a nutshell. Many thousand graves have been examined by one party of observers, and certain results repeatedly found. Many thousand graves have been examined by another party of observers, in other localities, and such customs have not been found."

I would analyse the contents of the nutshell in a slightly different manner. Both parties, working in every region in Egypt, have found precisely the same state of affairs. One party, under the influence of the glamour of Egypt and what is said to happen in early Italy and Europe and modern Africa, interprets it as evidence of cannibalism and "Jack-the-Ripper" practices. The other has put forward a simple record of all the facts observed and the

obvious explanation of them, and has found, not only no sign of any deliberate mutilation, but overwhelming evidence of the reality of the ancient Egyptian's profound reverence for the bodies of his dead relations, and of his horror of mutilating them, even for the purpose of making the incisions necessary for embalming.

Since this correspondence began, a full discussion of all the data relating to the subject under consideration has been published in the report for 1907–8 on the Archæological Survey of Nubia. There the facts will be found recorded for the use of anyone interested in the matter.

G. ELLIOT SMITH.

Effect of Heat on Soils.

MR. A. D. HALL in his opening address to the Agricultural Sub-section of the British Association at Sheffield mentioned "a process of heating the soil before sowing" and "a process of firing the soil preparatory to sowing the crop," both of which seem very similar to "burning bush" as practised in the West Indies. On reading Russel and Hutchinson's paper on "Partial Sterilisation of Soil" in *Journ. Agric. Sci.* for October, 1909, it struck me that their work afforded a probable explanation of "burning bush," and I now make the suggestion in the hopes of obtaining some evidence. The process seems to be similar to that known as *chena* in Ceylon, *ladang* in Malaya, and *jhuming* in India (see J. C. Willis, "Agriculture in the Tropics," pp. 1 and 2), and perhaps someone with experience of the East could throw further light on the question.

It is a common practice in Trinidad for a small cultivator to rent a piece of abandoned land, which is cleared by burning the "bush" in the dry season. In the wet season the clearing is generally planted with maize, which is usually followed by cassava, yams, tanias, &c. In a few years the cultivation is no longer remunerative, and the land, once abandoned, quickly goes back to "bush." One explanation is that the ashes of the burnt "bush" supply a certain amount of mineral plant food in a readily available form (the nitrogen in the plants burnt would, of course, be lost). This plant food would presumably produce an increased yield, but the effect would not last many years. Another—and I think a more probable—explanation is that the burning results in a partial sterilisation of the soil, with a greater production of ammonia. The fact that maize is the first crop grown after the "bush" has been burnt is significant, since it is a crop which is benefited by a nitrogenous manure.

C. HAROLD WRIGHT.

Government Laboratory, Trinidad, B.W.I.,
October 8.

The Colours and Spectrum of Water.

A PERUSAL of the articles which have appeared in your journal on this subject (NATURE, vol. lxxxiii., pp. 48, 68, 188, 487, and vol. lxxxiv., p. 87) leads me to ask if the spectrum of water has ever been thoroughly investigated. It is difficult to believe that this has not been done, and yet there is but little allusion to the important bearing the character of the spectrum must have upon the colour. I should be glad to learn what is the origin of a feature I have sometimes observed in the spectrum, as seen with a "miniature spectroscope" by Browning. This is a dark band or line at about wave-length 6000, which I noticed in June, 1887, in Sark, in clear water, both in the sea and in fresh water. The latter was bluish-green, and the sea was green. So far as this line would have any influence on the colour of the water, it would tend to make it blue; but the colour would be much more influenced by the very strong general absorption in the whole of the red and orange beyond the dark line. In the sea water this general absorption extended more feebly to the D line of the solar spectrum, and even to the dry-air band δ.

In the deep green water of Lago Maggiore the spectrum was almost identical with that of the sea at Sark; I made the wave-length of the dark line about 6050.

The Lake of Geneva is noted for the deep blue of its clear water. In it I failed to see the dark line, but the general absorption of the red end of the spectrum was very striking.

The bluest water I ever saw—bluer than the Mediterranean, Red Sea, or Indian Ocean (I have not been to Capri)—was, however, the Blaue See, near Kandersteg, and the Lago di Garda. In the former, pieces of pot at the bottom appeared pure Prussian-blue. During a stay of a few days by the Lago di Garda I could not make out the law of its changes in apparent colour, but at times it was far bluer than the bluest sky I ever saw. It usually had a slightly greenish tinge. Both these lakes are extremely clear. I regret not having observed their spectrum.

T. W. BACKHOUSE.

West Hendon House, Sunderland, October 19.

Luminous Paint.

MR. C. A. EMERY, of Marlborough College, has directed my attention to a passage in Livy (xxxix., 13) where the following occurs:—

"Matronas Baccharum cum ardentibus facibus decurrere ad Tiberim, demissasque in aquam faces, quia vivum sulphur cum calce insit, integra flamma efferre."

This he renders:—

"The Bacchantes would run down to the Tiber with burning torches, and plunging them into the water would take them out with the flame unextinguished, because they were covered with a mixture of living sulphur and lime."

The expression "vivum sulphur" is thus explained by Pliny:—

"In Italia quoque invenitur sulphur. Genera quatuor: vivum, quod Graeci apyron vocant, nascitur solidum, hoc est, gleba: quo solum ex omnibus generibus medici utuntur. Solum (cetera enim liquore constant, et conficiuntur oleo incocta) vivum effoditur, translucetque, et viret."—Plinii Hist Nat. Lib., xxxv., 50.

It would seem, therefore, that calcium sulphide was discovered, and its luminosity observed, about nineteen hundred years before Marggraf, who in 1750 A.D. prepared the substance by "calcining gypsum with combustible matter." Eighteen years later Canton obtained the same effect by "igniting calcined oyster-shells with sulphur." (Inverted commas from Roscoe and Schorlemmer's "Treatise on Chemistry," under "Calcium and Sulphur.")

As neither of these manufacturing methods is difficult, it seems reasonable to suppose that one or other might have been known in Livy's day, and from the Latin text a modification of Canton's method seems probable.

Except for the above, I can find no direct reference to the discovery of calcium sulphide.

I noticed when reading Charles Reade's novel "The Cloister and the Hearth" that one of the more striking incidents depended on the use of a phosphorescent paint. As this powerful story is of the fifteenth century, I considered the phosphorescent paint an anachronism, for Brandt is said to have discovered phosphorus in 1669, and the "Bologna stone" (barium sulphide) was discovered only a few years earlier. But Reade may have been aware of the passage in Livy or may have known about Pliny's "Pholas"—the rock-boring mollusc (Piddock)—the phosphorescence of which is said to remain long after death.

Possibly some readers of NATURE may be able to throw more light on the origin of "luminous paint."

R. G. DURRANT.

The College, Marlborough.

Velocity of Negative Ions in Hydrogen at Atmospheric Pressure.

SOME time ago Prof. Chattock and I attempted to measure the velocity of the ions from a point discharging in pure and impure hydrogen at atmospheric pressure by the wind-pressure method, in the hope of finding that the negative ion was influenced by the presence of small traces of oxygen. The results were given in *Phil. Mag.*, April, in which it was shown that the change which the com-

plete elimination of oxygen caused was surprisingly great. Thus the apparent specific velocity of the negative ion in pure hydrogen was >230 cm. sec.$^{-1}$, volt cm.$^{-1}$, but it rapidly dropped to 7·6 on the addition of oxygen up to 1 per cent. The velocity of the positive ion was unaffected by traces of oxygen impurity, and was 5·8 throughout.

The change in the case of negative discharge might have been caused in two ways :—(*a*) by a great diminution with purity in the size of the negative ion in hydrogen; (*b*) by back discharge from the plate. If the latter were true the wind-pressure method breaks down, and the above values of velocity are not real. As it was certain that some back discharge was present, it seemed reasonable at the time to attribute the whole effect to this cause, but some recent work of Franck shows that it was probably not correct to do so.

Franck has shown (*Verh. d. D. Phys. Ges.*, xii., 291 and 613, 1910) that in gases such as argon and nitrogen the specific velocities of the negative ions obtained by α rays rapidly increased as the last traces of oxygen were removed. Thus in pure argon and nitrogen he obtained values as high as 206·4 and 144·6 respectively. As in the above, however, the positive ions were unaffected.

In the light of these results it is probable that the negative ions in point discharge in hydrogen, like those in other oxygen-free gases, are either corpuscles or are very small, although in our work the unknown amount of back discharge present prevented the determination of their true specific velocity.

These results throw considerable light on various phenomena occurring in point discharge, and I hope to publish later a more complete discussion.

A. M. TYNDALL.

Physical Department, University of Bristol.

An Irish Pteridosperm.

READERS of NATURE familiar with the many valuable additions to knowledge made by British palæobotanists within the last twenty years will be interested to know that in the course of rearrangement of the fossil plants in my charge in the botanical division of the National Museum in Dublin I have found, while comparing the specimens of Sphenopteris in this collection with those in the collection of the Geological Survey of Ireland (of which my colleague, Prof. Grenville Cole, is director), that in the latter collection there is a specimen of *Sphenopteris Hoeninghausi* from the Coal-measures of Glengoole, co. Tipperary, which shows all the characteristic features of *Lyginodendron Oldhamium* (including its spines, sclerotic network, venation, and conchoidal pinnule segments). Moreover, the specimen shows, *in direct continuity* with the vegetative part, the *Calymmatotheca Stangeri* condition regarded first by Scott, and now by many others, as probably the seed-producing part of Lyginodendron, from which the *Lagenostoma Lomaxi* seed has already, as Oliver and Scott have satisfactorily shown, in all probability fallen out. The specimen in question, if my interpretation is right, proves the correctness of the conjecture that *C. Stangeri* is part of the true pteridosperm Lyginodendron. I hope to publish shortly an illustrated account of the find.

T. JOHNSON.

Royal College of Science, Dublin, October 24.

Fermat's Theorem.

THE following proof of this theorem may be of some interest. Take the scale of notation the radix of which is x, and write down all the numbers of p digits, any or all of which may be zero. The number of these numbers is x^p. From one number we can, in general, derive $p-1$ others by cyclical permutation, the exceptions being those numbers that are periodic with a period that is a submultiple of p. Suppose p to be a prime, so that its only submultiple is unity. Then all the numbers except the x numbers that have their digits the same can be arranged in sets of p each (which are easily seen to be mutually exclusive). Hence the number of these numbers, which is x^p-x, is divisible by p, and if x is prime to p we see immediately that $x^{p-1}-1$ is divisible by p, which is Fermat's theorem. It is clear that this proof depends on permutations and combinations, not really on scales of notation, which, indeed, we have only used because of the clearness that they lend to its statement.

H. C. POCKLINGTON.

11 Regent Park Terrace, Leeds.

The Uganda-Congo Boundary.

WITH reference to the note on this subject in NATURE of September 1, has not the writer fallen into a slight error in quoting (p. 268) the definition of limits in the "Berlin Act" as applicable to the Congo State? Reference to the text of the Act will show that the passage quoted relates, not to the State, but to the Free Trade area in the Congo basin and neighbouring territories constituted at that time, with limits by no means coincident with those of the State. In fact, the "Berlin Act" had nothing to do with the State (as such), which was constituted, not by the conference, but by agreements with individual Powers negotiated about the same time.

The frontier originally claimed by the State in this region, and definitely accepted by several of the Powers, *was* the thirtieth meridian, for however unsatisfactory this might be, there could hardly, in 1885, have been a question of the adoption of the water-parting, which would at that date have involved far more uncertainty than the meridian. It was even doubtful to which of the two basins Lake Edward belonged. The mistake in 1894 seems to have consisted, not in the gratuitous introduction of the thirtieth meridian, but in its partial retention (viz. in the Ruwenzori district), to the detriment of Uganda, while replaced farther north by the water-parting, greatly to the advantage of the Congo State.

EDWARD HEAWOOD.

1 Savile Row, September 16.

IT is quite true that the definition quoted in the note was that of the Free Trade area, but as the recognition of the Congo State, on our part, contained no definition of frontiers, we were entitled in 1894 to maintain that, in default of any specific deviation agreed upon mutually, the two frontier lines were identical. So far as I am aware, up to the date of the treaty of 1894 we had not admitted, nor, indeed, seriously considered, any claim on behalf of the Congo State to territories outside the Congo basin.

The history of the whole series of transactions is somewhat complicated and difficult, but it seems that, whatever were the intentions of the signatories to the Berlin Act and of the framers of the original agreements with the Congo State, any distinction between the State and the Free Trade area disappeared at an early period of their history, and had ceased to exist by 1894.

THE WRITER OF THE ARTICLE.

An Agaric with Sterile Gills.

THE occurrence of agarics with sterile gills is well known in certain species; it has been noticed most in those with purple spores. A few days ago I met with two specimens of *Panaeolus campanulatus* in Sutton Park, near Birmingham, in which the gills were of a pinkish-grey colour, somewhat closely resembling the tint of the dry pileus. There was a total absence of the usual variegated, grey and black, appearance. The pileus was large and well developed, measuring 1½ inches high and broad, stipe quite 4 inches long, and presenting all the characters of that of *P. campanulatus*. On examining sections of the gills it was seen that numerous basidia were present, projecting beyond the paraphyses; very many of them had the four sterigmata of full size, but not one over the whole of the gills of both specimens had produced a spore, nor were any produced afterwards, so long as the fungi were preserved. Unfortunately, they had been gathered before I saw them, so that it was impossible to ascertain if there was any visible cause for the sterility.

W. B. GROVE.

The Botanical Laboratory, Birmingham University.

ART THE COMRADE OF SCIENCE.[1]

IT has long been known that Mr. A. H. Thayer, the discoverer of the great principle of countershading in nature, was preparing a fully illustrated exposition of his observations and theories, and that his son was helping him in the enterprise. The present beautifully illustrated and finely printed work is the result. The great discovery of the obliteration of apparent solidity by means of countershading, first published

FIG. 1. — Plymouth Rock Hen, lacking countershading, and therefore conspicuous against a background of Plymouth Rock skins.

in 1896 (*The Auk*, vol. xiii., pp. 124 and 318), was convincingly illustrated in this country by the models prepared by Mr. A. H. Thayer, and presented to the natural history museums of London, Oxford, and Cambridge. An account of the principle, as well as the description of the Oxford model prepared by the present writer, appeared in NATURE for April 24, 1902 (vol. lxv., p. 596).

After the great and wide-reaching discovery which has probably been accepted by all naturalists who have studied it, the author has gradually extended his conclusion that the colours of animals are adapted for concealment, and carried it into regions where a very different interpretation had been accepted. Thus in his papers in the Transactions of the Entomological Society of London (1903, pp. 553–569), and in the *Popular Science Monthly* (December, 1909, p. 550), Mr. Thayer maintains that appearances which have been explained as warning, mimetic, and sexual are to be interpreted by the one dominant and universal principle of concealment in nature. It cannot be said that, in these later developments, Mr. Thayer has succeeded in convincing any large number of naturalists, and it is therefore of especial importance that a detailed, complete, and fully illustrated statement should have appeared in the present volume.

The great bulk of the work, which opens with an introductory essay, dated 1907, by Mr. A. H. Thayer, is occupied, first, by a full and admirable exposition of the principle of obliterative shading and the combination with it of "picture patterns," and secondly, by a sketch of the distribution of these methods of concealment throughout vertebrate animals and insects, the birds being treated in far greater detail than any other group. Mr. Thayer's later views are not expounded separately, but are to be found scattered in various parts of the volume, which must be carefully studied as a whole by any reader who would do justice to the author and his father.

The value of obliterative countershading is well illustrated by figures of two breeds of fowl in which it is lacking. However closely such fowls may harmonise with the colour of a flat background, they must be rendered conspicuous against it by means of shadow, as is at once obvious in Fig. 1.

A series of interesting photographs of models makes it clear that obliterative shading is even more important than markings for the purpose of concealment. Thus, the model in Fig. 2 represents a relatively inconspicuous gap in the pattern of the background; that in Fig. 4, possessing the pattern, is by comparison a strikingly distinct and solid object. We are thus led to conclude that the perfect obliteration represented in Fig. 3 depends in larger measure upon the principle illustrated in Fig. 4 than upon that shown in Fig. 2.

The vast importance of this same principle is demonstrated, not only by diagrams, but by large numbers of representations of actual animals to be found in later pages of the work. A striking example is seen in Fig. 5, where the animal has been photographed in a position which reverses the obliterative tendency of its colouring in the normal position. We here get maximum conspicuousness—the lightest tint in the strongest light, the darkest in the deepest shadow.

The relation of the pattern to perspective is discussed in an extremely interesting and original section (chapter iii.), where the conclusion is reached that "the obliteratively shaded surface must bear *a picture of such background as would be seen through it if it were transparent*." This is well illustrated by the diagram shown in Fig. 6, where the smaller pattern of the highest part of the bird is seen against the receding, and therefore to the eye diminished, details of the background.

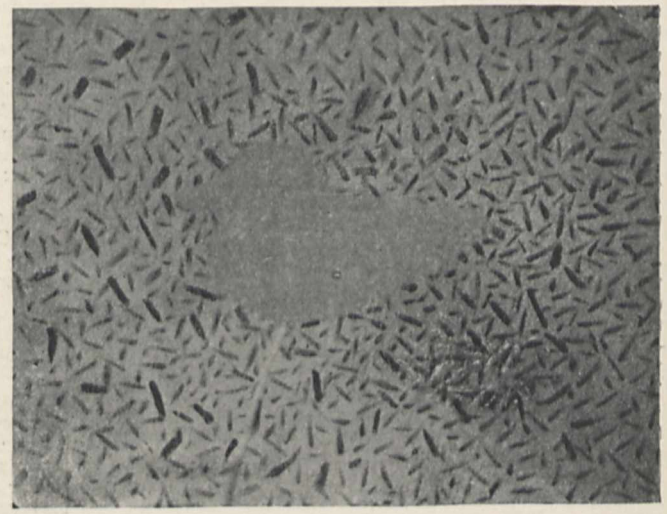


FIG. 2.—Bird-shaped Solid Model, obliteratively shaded in full, and correctly lighted, but revealed by the want of pattern.

Mr. Thayer discriminates sharply between all such *obliterative coloration* depending on countershading combined with background picturing, and *mimicry*, or the simulation of a solid object. He truly points out

[1] "Concealing-Coloration in the Animal Kingdom." An Exposition of the Laws of Disguise through Colour and Pattern: being a Summary of Abbott H. Thayer's Discoveries. By Gerald H. Thayer. With an Introductory Essay by A. H. Thayer. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1909.) Price 31*s.* 6*d.* net.

that the goal of the first principle is *invisibility*, of the second *deceptive visibility*. "The latter principle is open to unlimited variations of method and result, whereas the former . . . is in its main essentials strictly limited. There are innumerable kinds of solid objects for animals to simulate in appearance, but there is only *one* way to make a solid object in a natural lighting cease to appear to exist" (p. 25).

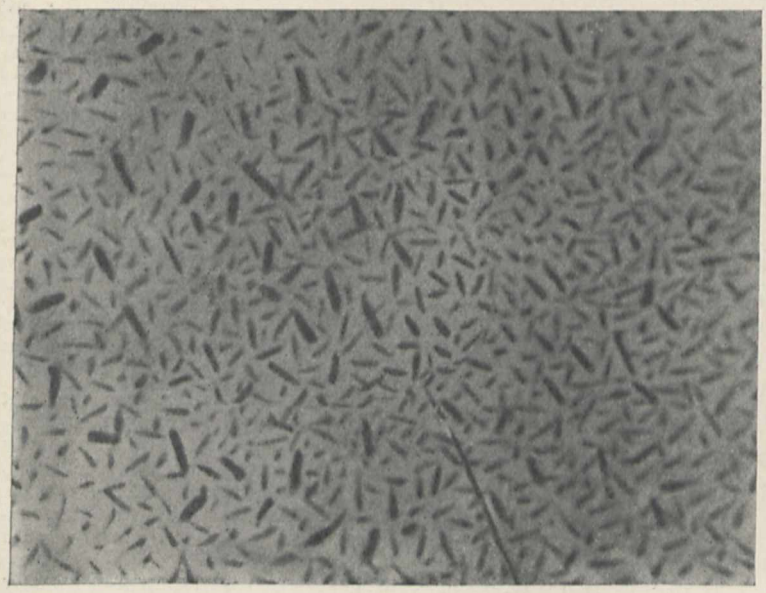


FIG. 3.—Model similar to that shown in Fig. 2, and similarly lighted, but concealed by possessing a pattern like that of the background.

The use of the term "mimicry" to indicate the second category, although common, is to be deprecated. It is inconvenient to apply the same term to the resemblance of a moth to a wasp, and that of a caterpillar to a twig. The wasp-like moth is always spoken of as an example of mimicry; and the term *imitation* may be conveniently used in a technical sense to include the twig-like caterpillar and all the other innumerable examples of special protective resemblance. The important classification of cryptic resemblances, which Mr. Thayer now establishes more thoroughly and correctly than before, may be appropriately expressed by the use of the terms (1) *obliterative* or *aphanistic coloration*, and (2) *imitative* or *eikonic resemblance*.

No fewer than sixteen out of the twenty-seven chapters of the book are concerned with the colouring of birds, the patterns being classified according to the nature or distance of the background that is pictured. A vast amount of patient and loving observation of nature is here summed up and expressed. We shall look forward with the deepest interest to the comments of those special students of bird-life in Europe and America, who will make a point of testing these conclusions by fresh observations made in the field from the author's point of view. This is written in no spirit of doubt, for Mr. Thayer's statements and illustrations are, with certain exceptions, to be considered later, most convincing. No naturalist could reasonably doubt, for example, the significance of the grass-pattern shown in Fig. 7, which the author justly describes as "one of the most remarkable photographs ever taken of obliteratively coloured birds in nature" (p. 46). The two points by which the bird is most easily recognised are the dark eye and the dark shadow under the feathers, so that this wonderful illustration helps us to understand the importance of eye-masking markings (see pp. 81, 82), as well as of obliterative counter-shading.

The coloured plates of the "Male Ruffed Grouse in the forest" (II.), the "Cottontail Rabbit" (VII.), and the "Copperhead Snake on dead leaves" (XI.) are very remarkable illustrations, justly claimed by the author and his father to be "the first ever published, which rightly illustrate and in some respects do justice to the wonderful effects of obliterative coloration, based on the great law of *obliterative shading*" (p. 128).

The five coloured plates of caterpillars (XII.–XVI.) are extremely beautiful, showing for the first time the important part played by obliterative shading in these forms. The attitudes of caterpillars generally must be re-examined in the light now thrown upon them by this great artist-naturalist; for there is little doubt that many of the best-known and commonest illustrations represent an inaccurate position. It is unfortunate that the names of so few of the figured species were ascertained, but there should be little difficulty in the identification of such beautiful reproductions. There is an evident inadvertence in the orientation of Fig. C or D on plate XII., both represented in a similar position, although D is described as the reverse of C.

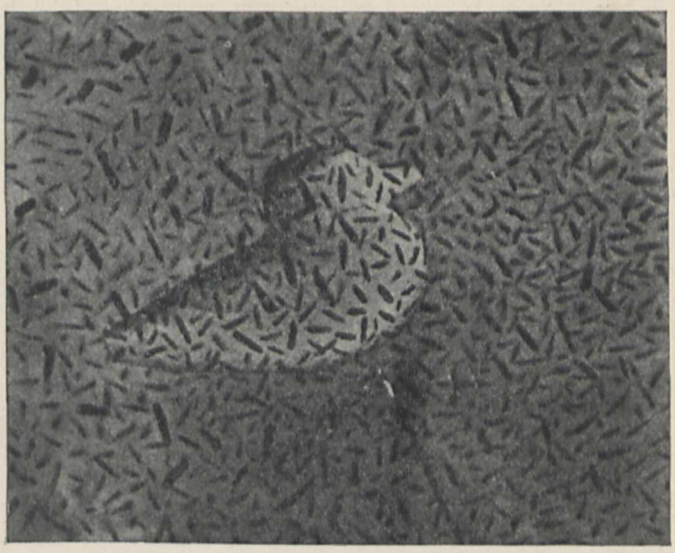


FIG. 4.—Model similar to that shown in Fig. 3, and similarly patterned, but wrongly lighted and therefore conspicuous.

The necessities of space prevent a further account of this remarkable and splendidly illustrated exposition of the principles of obliterative colouring, and its distribution throughout the animal kingdom. We must now, in the concluding paragraphs, deal with special

interpretations and later developments which are likely to cast an entirely undeserved suspicion upon this admirable account of a great discovery.

In the first place, in the present state of our knowledge of a most difficult subject and the great need for numberless exact observations and precise records,

FIG. 5.—Domestic Hare laid on its back, out of doors, so that the oblite ative shading is reversed. Photographed from life.

illustrations in which the background has been "copied, colour-note for colour-note," from the animal itself, are a hindrance and not a help (plates I., III., VI., VIII., IX., X., and Fig. 123). The inferred environment is not necessarily incorrect—the rattlesnake (Fig. 123) at least is almost certainly represented with truth—but the inference is not scientific evidence, and it is likely to act as a hindrance, because some readers may be led into accepting it as a proof, others into scoffing at the whole subject. Furthermore, the inferred significance of the animal's colouring may be wholly mistaken, as I doubt not is the case with the beautiful and poetic plates IX. and X., representing "flamingoes at dawn or sunset, and the skies they picture." Such an interpretation is quite inconsistent with the wonderful representation of flamingo life prepared by Dr. F. M. Chapman for the American Museum of Natural History, New York. The present writer had seen the representation and knew well the unrivalled knowledge and experience which had gone to the making of it, and he therefore wrote to his friend and asked his opinion as to the meaning of the colours of these birds. Dr. Chapman kindly replied as follows :—

My observations of flamingoes (which I should add were made only in the Bahamas) lead to the belief that our American bird (*Phoenicopterus ruber*) is protected by its haunts and habits rather than by its colour. At all times, whether feeding singly or when nesting and solidly massed in hundreds, it is from any point of view an exceedingly conspicuous object. Apparently, therefore, it thrives only when it is beyond the reach of predatory Mammalia and Reptilia, its centres of abundance being oceanic islands, like the Bahamas or Galapagoes, or small keys off the mainland. It is true that flamingoes formerly visited the shores of southern Florida in great numbers, but they have never been known to nest there, and they frequented only the vast shallow bays where they could feed far from land, and where it was almost impossible to approach them; for it should be especially noted that these flamingoes are as shy as they are conspicuous. The character of the regions they frequent usually enables them to see as far as they can be seen, and the brilliancy of their colours seems to be compensated for by their extreme wariness. For example, a professional hunter of flamingoes on the Florida coast tells me that for six days a week for two consecutive weeks he pursued a flock, estimated to contain 2000 flamingoes, without securing a single specimen.

I am, of course, aware that man should not be classed among the natural enemies of the flamingo, nor their colours be explained from the human view-point, but the fact just mentioned at any rate illustrates the bird's alertness and the difficulty with which it is approached.

As, in the Bahamas, at any rate, the flamingo feeds only on molluscs, its colours are apparently not deceptive or aggressive. In short, it is my belief that the flamingo's colours are to be placed among the cases where colour has run riot, unchecked by any need for protection from enemy or prey, and that the bird has continued to exist only where the dangers to which of necessity its colour would expose it are happily absent.

The flamingo has been considered at some length. With regard to the peacock in the wood (plate I.), it can only be said here that the interpretation is hardly likely to be accepted by anyone who has watched the male bird displaying before the female or in rivalry with another male.

Nor are many naturalists likely to be convinced by Mr. Thayer's interpretation of recognition markings and warning colours, an interpretation rendered sufficiently clear by Figs. 8 and 9. Here, as in all other examples of animal colouring, Mr. Thayer considers the one dominant interpretation to be concealment,

FIG. 6.—Diagram showing the picturing of perspective by animals' patterns. The bird is supposed to be looked at from the side and above so that the smaller pattern of its head and neck is against the more distant and therefore reduced pattern of the ground surface.

the Spilogale's "dark stripes passing for vegetation, and his white stripes for the sky." This explanation of warning colours has been recently criticised, and in the opinion of the present writer entirely refuted, by Mr. R. I. Pocock (Proc. Zool. Soc., 1908, pp. 944–959), and the corresponding interpretation of recognition

FIG. 7.—Rocky Mountain White-tailed Ptarmigan on her nest. Photographed from life by Evan Lewis.

markings by Mr. E. Thompson Seton ("Life-Histories of Northern Animals"). As regards the interpretation of the mimetic resemblances of butterflies as due to a syncryptic resemblance to flowers and the surrounding vegetation and its interstices, it is impossible to say

FIG. 8.—Spilogale, or Little Striped Skunk, seen from above—man's and hawk's point of view. From photograph of a stuffed skin, out of doors.

more than that such a theory does not explain many well-known characteristics of the mimetic groups.

Whatever be the verdict of the moment, a man will be judged and ought to be judged by what he has done, not by what he has failed to do. It has been

FIG. 9.—Spilogale, seen from below—mouse's and cricket's position. From photograph of stuffed skin, out of doors.

said that "What's hit is history, what's missed mystery." While the misses do not make the hits any the less, the mystery may serve to throw light upon the workings of a mind that has made history.

E. B. P.

ETHNOGRAPHY AT THE BRITISH MUSEUM.

THE purchaser of this handbook will feel no regret that it is not cast in the form of a guide. Many, perhaps most, of those who buy museum publications do so as they leave the building, and although the fate of such mementoes cannot be determined with certainty, it may be assumed that they are sometimes read at leisure. A descriptive handbook on broad lines is, therefore, a better investment for the average visitor than a guide of the old, and arid, type. The present example is worthy of the best fate that can befall it at the hands of the man who looks in from the street, and it will be cordially welcomed by those whose interest in ethnography is less casual and fortuitous.

The introduction contains a brief survey of the progress of geographical exploration from classical times onward, and traces the discoveries which rendered possible the development of the comparative study of mankind. The scope of ethnography is defined in a concise discussion of man in his relation to the material world, to his fellows, and to the supernatural.

The greater part of the book, which deals with the collections as exhibited in the Museum, is arranged under geographical headings, and the limitations of the collections are naturally reflected in the handbook. Thus, under Persia, India, and Japan, the subject of arms and armour is practically the only one considered, whilst China is only referred to incidentally. The culture of Tibet, Ceylon, Indonesia, and some of the tribes of northern and central Asia, is entered into in greater detail. Useful summaries are given of the general conditions of the life and culture of the peoples of these areas, with reference not only to their arts and industries, but also to their customs and beliefs. Racial origins and affinities are briefly considered, and the latest views are stated. The same treatment is adopted with regard to the peoples of Australia, Oceania, Africa, and America. Special mention may

[1] "Handbook to the Ethnographical Collections." Pp. xv+201. (London: Printed by Order of the Trustees, British Museum, 1910.) Price 2s.

be made of the able condensation of the complex subject of the culture, distribution, and relationships of the Negro and Bantu tribes of Africa.

An important feature, and one which will be widely appreciated, is the large number of illustrations, many of them in the form of plates. The geographical and tribal index also adds greatly to the value of the book for reference purposes.

Contemporary portrait figure in wood of Bope, great chief of the Bu Shongo, *c.* 1790. Kasai District, Congo State. From the British Museum "Handbook to the Ethnographical Collections."

Whilst giving ungrudging praise to the handbook, the hope must be expressed that the extension of the museum buildings will afford opportunity for the accommodation of the ethnographical collections under conditions that will enable them to be displayed in a manner more worthy of their importance. The provision of a section of technology, for example, would not only be an extremely popular addition, but would immensely increase the educational value of the collections. It seems doubtful, however, whether those who intermittently rule over us have yet been convinced that museums are educational institutions. It is certain that they have not appreciated the importance of the study of man, working-man excepted.

H. S. H.

SIGHT TESTS IN THE MERCANTILE MARINE.

THE Board of Trade has issued an important report (Cd. 5256) on the sight tests used in the mercantile marine during the year 1909. Out of 6084 candidates, 56 failed in form vision, and were not re-examined; while out of the remaining 6028 there were 86 failures in colour-vision, of whom 31 appealed and were re-examined, with the result that 15 were passed and 16 were finally rejected. The total absolute rejections were, therefore, 71 in 6084, or 1·49 per cent. During the first ten months of the year, colour vision was tested by the three skeins of wool originally recommended for the purpose by Holmgren; but during November and December two other skeins, a purple and a yellow, were added. With these the rejections were in somewhat larger proportion (1·81 per cent. against 1·17) than when only three skeins were used; but the total number of candidates examined by the new method (882) was hardly sufficient to afford any basis for a conclusion.

In the case of the fifteen men who, having originally been rejected as colour-blind, were re-examined and accepted on appeal, the report gives no information on the very important point of the precise methods employed in testing them, or on the precise "matches" made by them, either at the first examination or at the subsequent one. In the case of those who were finally rejected, we are told what they did. "A.B.," for example, selected "sage-grey, fawn, and greenish-yellow" as matches for the green skein, "greenish-blue" as a match for the pink skein, "blue and carmine," as a match for the red skein, and so on, until he is finally dismissed as "completely green-blind." But of a man who, having been rejected, "appealed and passed," we are not told anything but that he had previously "failed in the colour-vision tests," and we have no information as to how the alleged "failure" was redeemed.

There can be no question that, in every case in which an original rejection has been overruled, very clear evidence of error on the part of the first examiner, and of special care on the part of the second one, should be forthcoming. We believe that failure to reach correct conclusions by means of Holmgren's three skeins would be due, probably in all cases, to neglect of Holmgren's very precise instructions as to the manner in which they should be used; and, if it were found that the original conclusions of any examiner were often overruled on appeal, an urgent necessity for reconsidering his fitness would arise. It is manifest that no original rejection should be set aside except upon the clearest and most satisfactory evidence; because, however much we may sympathise with instances of hardship, if such there be, or with worthy men deprived of a calling, it must be remembered that the difference between red and green is to the normal-sighted so complete and absolute that they can scarcely understand even the possibility of confounding them. A case in which the difference is less than this, a case in which there is any question, any possibility, of confusion between the two colours in any conditions of weather or of illumination, is

one in which the benefit of any possible doubt should not be given to the individual examined, but to the persons who may possibly be carried in a ship or a train placed under his control. It follows that the evidence on which a re-examined man has been accepted is of far more public importance than that on which he has been rejected; and it is to be hoped that, in the next report upon the subject, this aspect of the question will be borne in mind.

Of the 71 rejections for colour-blindness, 35 were on account of red-blindness (complete in 20, incomplete in 15), and 36 on account of green-blindness (complete in 23, incomplete in 13), so that the several defects are practically of about equal frequency. No case of monocular colour-defect is recorded.

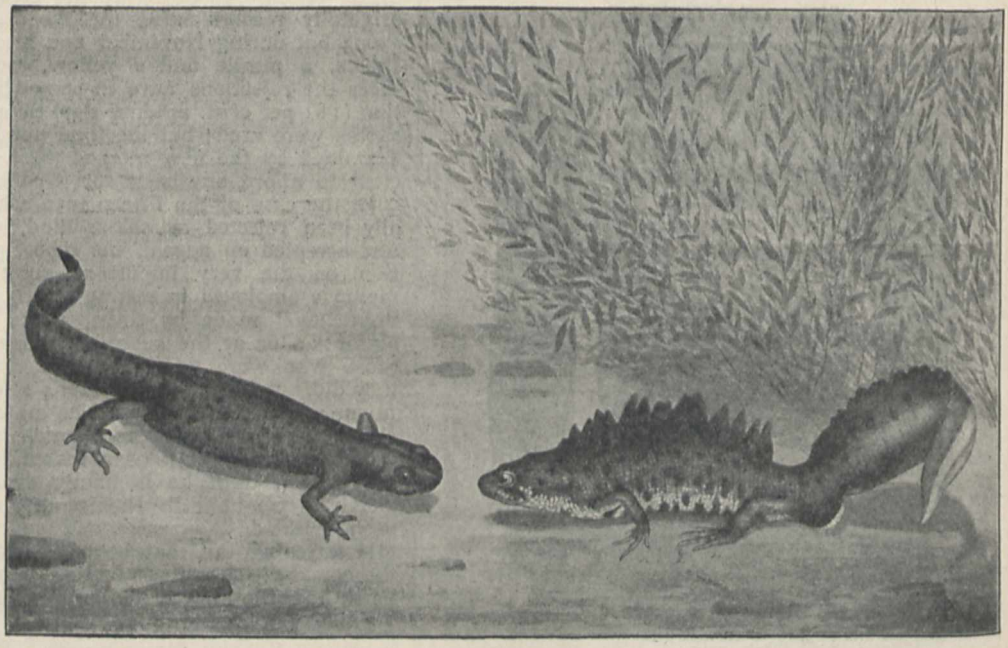
The last paragraph of the report announces that, after January 1, 1914, the standard of form vision in the mercantile marine will be raised, and that candidates will be required to possess full normal vision in one eye, and "at least" half normal vision in the other. It will probably be news to most of our readers that less than this very modest standard has hitherto been required; and ophthalmologists generally will, we think, agree with us that the possession of only half vision, in one of his eyes, by a young or middle-aged mariner, is a circumstance which would fully justify his being submitted to periodical re-examination. "Half-vision" would in many cases indicate disease, often of a character likely to be progressive.

STRUCTURE AND FUNCTION.[1]

THE aim of this stately book is to show how the various types of animals have solved the fundamental problems of life, and how their structure is to be interpreted in terms of their functions and environment. The keynote of the book is to keep the animal alive and to study its adaptations. We must congratulate the author on the success of his endeavour, for he has written a worthy successor to the once-famous, now forgotten "Anatomischphysiologische Uebersicht des Tierreiches," by Bergmann and Leuckart. The outstanding merit of the achievement is in its unified or synthetic presentation of the facts—it is at once anatomical and physiological, œcological and evolutionist. This general biological outlook is very useful for the analytic student.

Dr. Hesse has evidently worked for a long time over his book—it is scholarly, up-to-date, and clear, and commands our warmest admiration. It deals with the individual organism and the processes of its life—such as movement and feeling, nutrition and reproduction. There is nothing remarkable in the mapping out of the subject; it is the working-out that is remarkable in its thoroughness and lucidity. In treating of reproduction, the author necessarily gets beyond the individual, and leads on towards the second volume, in which Prof. Doflein is to deal with the relations of organisms with one another and to environmental influences.

The book is illustrated with quite remarkable generosity and skill. It is not merely that the illustrations are very numerous and beautiful, but they are peculiarly fresh and interesting, and there is a delightful intellectual flavour about them. They not only adorn the tale, they tell a story by themselves. Dr. Hesse's emphatically distinctive book has been well treated by the publishers, and we hope the result will be a great success. We have no counterpart of it in Britain.



Episode in "Courtship" of Crested Newt. From Hesse and Doflein's "Tierbau und Tierleben."

[1] "Tierbau und Tierleben in ihrem Zusammenhang betrachtet." By Prof. R. Hesse and Prof. Fran z Doflein. Band i. Der Tierkörper als selbständiger organismus. By Prof. Richard Hesse. Pp. xvii+789. Leipzig and Berlin: B. G. Teubner, 1910.) Price 20 marks.

RECENT INVESTIGATIONS ON PELLAGRA.

THE visit of Dr. Louis Sambon to Italy to investigate the cause of pellagra has proved eminently successful. Dr. Sambon was sent out by the Pellagra Investigation Committee in March, 1910, in consequence of his having advocated for some time that pellagra was not caused by the consumption of diseased maize, as has been thought to be the case hitherto. Dr. Sambon was of opinion that pellagra was due to a protozoal infection, and that the disease was conveyed by an insect in much the same way as several other ailments are transmitted, such as malaria, sleeping sickness, kala-azar, filariasis, &c. The members of the Pellagra Investigation Committee, finding Dr. Sambon's idea was based on sound scientific reasonings, proceeded to collect money for the purpose of enabling him to proceed to Italy and pursue investigations on the spot.

Dr. Sambon visited the provinces of Bergamo, Milan, Brescia, Padova, Rome, and Perugia, and wherever he came in contact with the disease he found that the consumption of maize, whether diseased or not, had nothing to do with the prevalence of pellagra. Endemic centres of the disease have existed in Italy persistently for at least a century. The disease is not met with in towns, but only in certain parts of the country, namely, in the districts where a sandfly of the class Simuliidæ, and belonging to the genus Simulium, is met with. No actual parasite has as yet been discovered in the blood; but the geographical distribution of the disease, its epidemiology, and its close resemblance in behaviour to other diseases in which a parasite has been discovered, confirms Dr. Sambon in the belief that it is a protozoal infection carried by a sandfly that is the etiological factor in pellagra.

As a parallel we have the case of yellow fever. In yellow fever we know the agent of transmission to be a mosquito. No parasite has been discovered in the blood in yellow fever, but the experiments carried out are so conclusive that the disease is of the nature of a protozoal infection that yellow fever is classed as one of the protozoal infection with a parasite that is ultra-microscopic. Pellagra is in the same category. There are certain factors in infections of this kind which enable us to conclude that a disease is of a certain class, although the microscope is at fault.

Dr. Sambon proved:—(1) That the endemic centres of pellagra in Italy have remained the same since the disease was first described. (2) That the season of recurrence of pellagra coincides with the season of the appearance of the fully-fledged sandfly to the extent that even if the spring is early or late so the sandfly is early or late in appearing, and synchronously pellagra cases correspond in their appearance. (3) In centres of pellagra infection whole families are attacked at times simultaneously. (4) In non-pellagrous districts when a pellagrin is met with the disease never spreads to others, and the patient acquired infection during a sojourn in a pellagrous district. (5) In the case of a family that has moved from a pellagrous district to a non-pellagrous district the children born in the former are pellagrins, whilst those of the children born subsequent to removal to a non-pellagrous district do not develop the disease. (6) The disease is not hereditary, although infants a few months' old may become infected, especially if taken out to the fields in pellagrous districts, where their mothers work during the season, when the sandflies are in evidence. (7) Pellagra is not contagious, but is transmitted to each individual by an infected sandfly.

Dr. Sambon, from the epidemiological and topographical aspects of pellagra alone, has been able to show by well-nigh conclusive proof that pellagra is an insect-borne disease. It is hoped that money will be forthcoming whereby a study so well began and so fruitful in results shall be further investigated, so that not only Italy but the many countries in which pellagra is a scourge and a calamity may be freed of one of the most frequent causes of insanity.

DR. MELCHIOR TREUB.

THE death of this distinguished botanist, which occurred at Saint Raphaël, Var, on October 3, closes a career of remarkable brilliancy. Born at Voorschoten, near Leyden, on December 26, 1851, Melchior Treub entered the University of Leyden in 1869, and shortly after the completion of his undergraduate career was appointed assistant in the Botanical Institute there. This position he occupied from 1874 until 1880, when he was appointed, in his twenty-ninth year, to the directorship of the Botanic Garden at Buitenzorg, in Java, which had become vacant owing to the untimely death of the talented Scheffer.

The striking quality of Treub's early work, published before and during the tenure of his assistantship at Leyden, more than justified the selection by the Netherlands Government of so young a man to fill so important a post, and afforded the happiest auguries for his success in this new and wider field. But high as were the expectations which Treub's friends were entitled to entertain, their most sanguine hopes fell far short of what Treub was able to accomplish during the twenty-nine years of his sojourn in Java.

Succeeding as he did a man of high aims, whose unwearied exertions in giving effect to them were largely responsible for his early death, Treub, with rare administrative skill, brought the renowned institution of which he had been given charge to a pitch of material perfection and a position of scientific importance far surpassing his predecessor's fondest aspiration. While developing and extending the economic activities whose foundations had been laid by Scheffer, Treub was able in the midst of his multifarious and engrossing administrative duties to undertake and complete the investigation of many important scientific problems, the details of which enrich the pages of the famous "Annales du Jardin Botanique de Buitenzorg," founded by Scheffer, and edited from the second volume onwards by Treub.

To the herbarium which has been associated with the Buitenzorg Garden since its foundation, and to the museum organised by his predecessor, Treub was able, almost from the outset of his directorship, to add a series of well-equipped and fully-staffed laboratories for the prosecution of technical and scientific research. One of his earliest acts was to persuade his Government to provide a special laboratory reserved for the use of foreign workers, who might care to visit Java and undertake, in the midst of its rich vegetation, original botanical study.

Treub's own contributions to the advancement of natural knowledge have been so numerous and are so well known to all students of general botany that they need not be recapitulated here. One of the outstanding features of his work is its reflection of the catholicity of his interests, which prevented him from ever becoming a specialist. His exceptional capacity for observation and his thorough mastery of method enabled him to enter with equal success many fields of study. Everything he had occasion to say on morphological, embryological, physiological, or phytogeographical subjects was worth saying, while his faculty for exposition enabled him so to present his results as always to arrest attention. The one field of botanical activity which he never entered was that of systematic study, with the needs of which, however, partly from the width of his sympathies, partly owing to his absorbing economic interests, he was fully conversant; perhaps none have benefited more immediately or more greatly by his kind and ungrudging assistance than systematic students.

Equally unnecessary here is any *résumé* of the results of Treub's practical activities or any recapitulation of the benefits thereby accruing to tropical agriculture, forestry, and pharmacology. The great value of the assistance given by him to the industries concerned has, however, lain in the fact that the practical results attained have always depended on scientific research. So ably did he teach the lesson that successful practice must depend on science, that he was enabled, towards the close of his career in Java, to

effect the establishment of a truly scientific Department of Agriculture in the island, with himself as its head. In connection with this enterprise, he had occasion to visit various Eastern establishments, among them that organised by the United States Government in the Philippines. While in Manila, he contracted a severe illness the effects of which he was unable to shake off on his return to Buitenzorg, and some time thereafter he was compelled temporarily to relinquish his charge. A sojourn of some months in the mountains of Java effected so much improvement in health that he was able to return to duty. But again his health gave way, and a little over a year ago he was reluctantly compelled to retire from the post he had filled with so much distinction for nearly thirty years. Under medical advice, he spent the winter in Egypt, and in spring went to live at Saint Raphaël, near Cannes.

His retirement was a source of unmixed regret to his colleagues in Java, because of the loss of his hand from the helm. To his many friends in Europe, however, the necessity did not present quite the same aspect; these looked forward to the double pleasure of renewed personal intercourse with Treub, and to that increased scientific activity for which his release from heavy official duties promised him opportunities.

This was not to be, and botanists throughout the world now mourn the loss of one of the ornaments of their science. To those who had the privilege of his personal friendship the blow is greater still. They have lost in Treub a brilliant, stimulating, and sympathetic colleague, one whose width of culture and charm of manner rendered intercourse with him a continual pleasure. Above all, they have lost a kind and constant friend.

DR. SIDNEY RINGER.

THE career of Dr. Sidney Ringer, which came to a close recently at Lastingham, Yorkshire, is a fine refutation of the common statement that the cares of medical practice do not permit of active scientific research in these days. Engaged in a large and successful consulting practice, and in teaching in a large medical school, he yet found time for much work in the advancement of pure science. His interests in medicine lay largely in therapeutics, in which his text-book remains authoritative, and his experimental researches appear to have arisen from the desire to put therapeutics upon a more secure foundation by investigating the effects of drugs on the animal organism. From 1870 to 1880 he published a number of papers dealing with the effect of various alkaloids and other drugs on animals, and these were continued at intervals in his later years. Many of these have been confirmed by later workers, and have taken their place in literature along with the work of the other founders of the modern pharmacological school. Among other subjects taken up at this time, the mutual antagonism exhibited by some of the alkaloids appears to have interested him in particular, and his experience with these probably influenced his later investigations.

From about 1880 Ringer struck out on a line of his own in his investigation of the inorganic salts of the blood and other tissues. At this time practically nothing was known of the biological significance of these, and their presence in the tissues was discounted in the physiology of the time. His investigations were so complete that the laboured investigations of a multitude of foreign observers in recent years have added little of fundamental importance. The essential feature which Ringer demonstrated was that while each of the salts induces abnormal conditions when applied alone to the tissues, each of them is necessary for normal function; living matter requires inorganic salts, but these must be presented in certain proportions.

In particular, the special *rôle* played by lime salts in the economy of the tissues was first demonstrated by Ringer, and its antagonism to sodium and potassium was developed in a number of papers in the *Journal of Physiology*. The sodium and potassium in the body fluids has to be counteracted by lime, and such "balanced" solutions, when formed artificially, are harmless to living tissues, as he showed in a number of instances. The solution of salts introduced by him, and universally known by his name, is to-day to be found in every biological laboratory, and its use has led to developments in many fields of research. The work on which its composition is based has often received too little attention. This may be accounted for by the time at which it appeared: Ringer's work was done before the modern views of diffusion and dissociation of salts in solution found their way into biology. And the investigators who approached the study of the biological relations of the salts from the side of the new physico-chemistry appear to have overlooked the work of those who had investigated the subject without the aid of the newer methods. Quite recently, however, some amends have been made in this respect, and it is now recognised that the pioneer in this work had reached in essentials the same position twenty years ago as has now been attained generally.

From 1895 onwards, Ringer ceased active work in research, but his interest was unabated. Two years ago he might have been seen in his old place in the physiological laboratory at University College investigating some point which had attracted his attention. One cannot help regretting that he could not devote himself wholly to experimental research, in which he showed outstanding powers; but, on the other hand, his clinical work could ill have been spared by medicine. Few in these modern times have been able to combine such insight in the biological aspect of medicine with an equal eminence in practice. C.

NOTES.

ON Wednesday, October 19, Sir William Ramsay conducted Mr. Francis Fox, chairman (who first suggested the utilisation of the Trenwith Mine pitchblende), and the other directors of the British Radium Corporation over their works at Limehouse. From the ore, which comes from the Trenwith Mine at St. Ives, 550 milligrams of radium as bromide have already been extracted, as well as the uranium which it accompanies, practically without loss. In an account which appeared in the *Times* of October 20, the reporter is in error in stating that Cornish pitchblende is richer in radium than the Austrian ore; on the contrary, the constancy of the ratio between uranium and radium has been repeatedly confirmed. From inspection of the Trenwith Mine, there appears good reason to hope that the present supply will be maintained, if not exceeded. The productive capacity of the works at Limehouse is about 100 milligrams a week.

A REUTER message from Stockholm states that this year's Nobel prize for medicine has been awarded to Prof. Albrecht Kossel, professor of physiology in the University of Heidelberg. Each prize will amount on this occasion to 7734*l*.

IT is proposed to hold in Paris next spring an international exhibition concerned with agriculture, oyster-culture, and fisheries. The organising committee has its office at 161 rue Montmartre, Paris.

THE Royal Society informs us that the studentship on the foundation of the late Prof. Tyndall for scientific research on subjects tending to improve the conditions to which miners are subject has been awarded for the ensuing year to Dr. T. L. Llewellyn, of Bargoed, Wales, for research regarding the cause and cure of the disease in miners known as nystagmus.

DR. BÁTHORI, writing from Nagybecskerek, Hungary, informs us that the Hungarian Academy of Science has this year awarded the Bólyai prize, of the value of 10,000 crowns, to Prof. David Hilbert, university professor of mathematics at Heidelberg. The jury consisted of two foreign mathematicians—Poincaré (to whom the prize was awarded in 1905) and G. Mittag-Leffler—and two Hungarians, Y. König and G. Rados, both from Budapest.

NEWS has been received from Italy of considerable damage wrought in the island of Ischia, accompanied by loss of life, due, in the first instance, to what is described as a cloud-burst. A hurricane has been referred to in the meagre accounts which have as yet reached this country, and from the local character of the phenomenon it seems likely that it was of the nature of a tornado, with torrential rain. The disaster occurred during Sunday night and Monday morning, October 23–24. The Paris *Bulletin International* for Monday, October 24, makes no mention of the disturbance, and contains nothing apparently associated with the occurrence except that at Naples the rainfall, measured at 7 a.m. for the preceding twenty-four hours, was 1·30 inches, and at Rome 0·87 inch. At Naples a further rainfall of 1·28 inches for the twenty-four hours ending October 25 is recorded in the Paris *Bulletin*, making the aggregate fall in forty-eight hours 2·58 inches. At Cette, in the south of France, 3·11 inches of rain fell in the twenty-four hours ending 7 a.m. October 25.

EARLY in November the University of Leyden proposes to celebrate the eightieth birthday of Prof. J. D. van Bemmelen. Prof. van Bemmelen was born on November 3, 1830, and has been engaged in scientific work since 1856. He has contributed greatly to the foundation of the Dutch school of physical chemistry. Prof. H. A. Lorentz, of Leyden, is the chairman of the committee organising the celebration, and Dr. W. P. Jorissen the secretary. It is proposed to publish as a memorial of the celebration a collection of memoirs by fellow-workers on the subjects with which Prof. van Bemmelen's name is associated, and already some sixty have been received. The memoirs will be published in one volume by M. C. de Boer Junior, Helder, Holland.

THE annual general meeting of the Institute of Metals will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W., on Tuesday and Wednesday, January 17 and 18, 1911. At this meeting a number of papers will be presented, including some of an essentially practical character, together with the preliminary report to the corrosion committee. It will be remembered that this committee was appointed some months ago to investigate cases of corrosion of the non-ferrous metals. The preliminary report will show the present state of our knowledge of the corrosion of non-ferrous metals and alloys, and will contain suggestions for a research into the causes of the corrosion by sea water of brass condenser tubes. The institute has now been founded just two years, and has celebrated its birthday by becoming an incorporated institution.

SPEAKING at the inaugural meeting of the Oxford branch of the Research Defence Society on Monday, Lord Cromer gave a number of instances of the value of research in medicine. In the course of his remarks he said:—Step by step the micro-organism of all the principal diseases—relapsing fever, leprosy, typhoid, tuberculosis, cholera, diphtheria, tetanus, influenza, plague, and dysentery—has been tracked to its lair. There is so great a wealth of evidence to show the results already achieved that it is difficult to decide which subject to mention particularly. The case of plague may, however, be taken as an example. When this terrible disease broke out in India some fourteen years ago a panic ensued. Vast sums of money were spent on disinfectants and other perfectly useless remedies. All was in vain. The epidemic continued to ravage whole districts. Then science took the matter up. The connection between the plague and the prevalence of rats was noticed. The fact that the rat flea, and not the rat itself, was the propagator of the disease was established. The anti-plague vaccine was discovered by Mr. Haffkine—but it took some years of observation before all these results could be obtained. When they were obtained science at last reaped its proud and well-merited reward. Colonel Bannerman, a distinguished Indian bacteriologist, said that in a number of cases in the Punjab, the aggregate population of which is about 827,000, some 187,000 were inoculated four months before the plague appeared, and that some 640,000 were not inoculated. Only 314 deaths occurred amongst the inoculated, while no fewer than 29,723 occurred amongst those who had not been inoculated. In other words, it may be said that experimental science saved the lives of about 8000 human beings, and those lives would not have been saved had it not been for the series of experiments conducted on living animals.

IN the Harveian oration delivered before the Royal College of Physicians of London on October 18, Dr. H. B. Donkin discussed "Some Aspects of Heredity in Relation to Mind." He pointed out that the hypothesis of hereditary criminality lacks substantiation, though "a considerably larger minority of persons with clearly appreciable mental defect, apparently of congenital nature, is found among convicted criminals than in the population at large." It cannot be assumed that the criminal is a racial "degenerate." In inquiring into the causation of "congenital" mental defect, Dr. Donkin retained a severely sceptical position. In some cases a lineal sequence of defectives is sufficiently frequent to render it highly probable that this condition is truly innate, and thus transmissible; in other cases it may be an indirect result of malnutrition and the like in the parent; and there are other possibilities. Dr. Donkin laid emphasis on the difficulty of making sure whether mental and moral characters are inborn or "acquired," but it may be pointed out that his view of the distinction is not exactly that held by most biologists. In regard to the inheritance of mental qualities, he followed Sir Ray Lankester in attaching great importance to "educability." "The innate and transmissible factor of the mind of man is the organic potentiality for making mental acquirements." He did not, however, enter into a discussion of the hereditary reappearance of distinctive mental traits, and we venture to point out that his identification of mental acquirements and modifications will not commend itself to biologists who care for precision. A very interesting feature in the oration was the collection of some of Harvey's observations on heredity, in which Dr. Donkin was inclined to detect an "inkling of the great question regarding 'inherited' and 'acquired' characters."

AT the Royal Society of Medicine on October 21 Dr. Franz Nagelschmidt gave a demonstration on "The Thermal Effects produced by High-frequency Currents." D'Arsonval directed attention, twenty-five years ago, to the "disagreeable burning sensation" that invariably accompanies the application of high-frequency currents. In the apparatus now shown this thermal effect is specially encouraged. Instead of the very high voltage (upwards of 100,000 volts) used in the ordinary forms of high-frequency application, the apparatus for diathermy gives about 800 volts, but the current which actually traverses the body reaches as much as 2½ amperes. Stronger currents have been employed, but are not, in Dr. Nagelschmidt's opinion, free from danger. The demonstrator placed two circular electrodes at opposite sides of a piece of raw liver, and showed how the passage of the current produced a solid column of coagulated liver, the borders of which were strictly limited by the diameter of the electrodes, the portions of liver immediately outside the cylindrical coagulated block remaining quite unaffected. The sharply limited action of the current was demonstrated even more graphically by means of a solution of white-of-egg contained in a glass trough. In this case, when the electrodes were placed near opposite ends of the trough, a column of coagulated albumin could be seen to form between them, and if a small current (0·5 ampere) were used the coagulation commenced, not at the electrodes, but at a point midway between them, and extended thence to the electrodes. The practical applications of this current were described, and it was shown how masses of diseased tissue (such as cancers) could be removed without loss of blood and without fear of damaging contiguous parts. Apart from this, many forms of localised pain could be relieved in a few minutes by applying an electrode to the area of skin overlying the painful region. Several other possible therapeutic uses of the diathermal currents were mentioned, including the power of these currents to strengthen and accelerate the heart's action. The high-tension current is obtained by a motor generator giving alternating current. The current to be applied to the patient is easily regulated from a switch table.

LIEUT.-COLONEL L. A. WADDELL, one of the leading authorities on the literature of Tibet, has deposited in the library of the India Office about one thousand books and manuscripts collected by him during the last expedition to Lhasa. These include a remarkable collection of ancient anatomical drawings from the Temple of Medicine at Lhasa, which preserve in pictorial form the old-world Indian beliefs regarding the structure and functions of the internal organs of the body. Much of this Indian surgical lore is probably of Greek origin, but the routes by which it may have reached India have not been clearly traced. This Tibetan series of drawings is believed to have reached Lhasa in the eighth century A.D. The collection will prove of much interest to students of Oriental surgery.

THE prehistoric boat discovered at Brigg, Lincolnshire, in 1886, formed the subject of a law-suit, the result of which was that it was awarded to Mr. Cary-Elwes, Lord of the Manor, who has now presented it to the Hull Museum. It is in a rather dilapidated condition, but has been repaired, so far as possible, under the supervision of the curator, Mr. T. Shepherd. In his useful series of museum manuals he has now given full details of the discovery, with various drawings and photographs illustrating this remarkable exhibit. To this is appended a bibliography, which shows that few objects of antiquity discovered in this country have given birth to a more extensive literature.

IN a supplement to the Annals of the Transvaal Museum Messrs. Gunning and Haagner have published a check-list of the birds of South Africa, based on Reichenow's "Vögel Afrikas," but bringing the subject up to date. The Zambezi-Cuneni line (lat. 16° S.) is taken as the boundary of the area, in which 919 species are recognised.

To the Annals of the Transvaal Museum for February Mr. J. Hewitt contributes an article on the zoological region of South Africa as deduced from the composition of its Lacertilia. After mentioning that the Zambezi-Cuneni line does not form a natural zoological boundary, as there is an extensive overlap of the southern and tropical faunas, the author expresses the opinion that the southern districts of Africa possess a fauna sufficiently peculiar to entitle this area to be regarded as a distinct zoological region, divisible into several subregions. "As regards the entity of the South African region as a zoological area, there can be no doubt but that the distinction between the peculiar endemic fauna of southern Africa and tropical Africa is too pronounced to permit of our regarding the South African region as merely a province of the large Ethiopian area, and, indeed, but for the infiltration of tropical forms, no one would hesitate to unite South Africa with Madagascar as a region quite distinct from the more northern parts of Africa. But the question of the northern boundary of our area is quite another matter." The author's conclusions seem to be entirely based on reptilian and amphibian evidence.

GREAT interest attaches to a paper by Mr. G. E. Pilgrim in vol. xl., part i., of the Records of the Geological Survey of India on new genera and species of mammals from the Indian Siwaliks, chiefly, it seems, those of the Punjab and Bugti Hills. Among numerous other forms, special reference may be made to *Sivapithecus indicus*, a new generic type based on the last lower molar of an anthropoid, which agrees in size and general form with the corresponding tooth of the gorilla, but has lower cusps and no cingulum. Upper and lower jaws indicate a second new anthropoid, referred to the European genus Dryopithecus. If rightly assigned to Mœritherium—and the reference is only provisional—a small and primitive proboscidean molar from the Bugti Hills apparently indicates a migration of the ancestors of the elephant-group from northern Africa to north-western India. From a phylogenetic point of view, perhaps the most interesting of all the new "finds" is the genus and species described as *Dorcabune anthracotheroides*. This species, according to Mr. Pilgrim, "shows the most extraordinary mingling of traguloid and anthracotheroid characters. Its upper molars may be described as like those of a Dorcatherium, only of an extreme bunodont and brachyodont type. . . . The same type of structure is displayed in the lower teeth, which, however, differ less, qualitatively, from Dorcatherium than the upper ones. . . . On the whole, the genus may be appropriately placed in the Tragulidæ."

THE determinations of a small collection of plants gathered by Dr. Th. Derbeck on the shores of the Gulf of Tartary, near the mouth of the Amur, are communicated by Mr. V. L. Komarov to the *Bulletin du Jardin impérial botanique*, St. Petersburg (vol. x., part iv.). A characteristic littoral formation was prevalent, in which *Elymus mollis*, *Rosa rugosa*, and *Poa glumaris* were conspicuous. Two new species are created in *Leontopodium tataricum* and *Saussurea Derbecki*. The list of 158 plants affords an interesting comparison with the flora of Saghalien.

A SHORT article communicated to the *Gardener's Chronicle* (October 22) by Mr. H. S. Thompson on botanising in County Kerry will interest the keen field botanist. Mt. Carrantual, the highest peak in Ireland (1041 metres), and a noted locality for Alpine plants, was the chief centre of attraction. The discovery of *Juncus trifidus* near the summit practically establishes a new record, and *Sieglingia decumbens* was also collected at an elevation above 1000 metres. Lower down, the two closely related species or varieties, *Saxifraga decipiens* and *S. Sternbergii*, were found in company with *S. stellaris*. Another find of great rarity was supplied by *Sisyrinchium angustifolium* growing with Drosera, *Lobelia Dortmanna* and bog Asphodel by Lough Caragh.

THREE generic revisions are published in vol. xliv. of Engler's *Botanische Jahrbücher*: Dr. M. Burret discusses the relationships and distribution of African species of Grewia, Dr. W. Moeser amplifies a former collation of the genus Helichrysum in Africa, and Dr. Heinz Stiefelhagen contributes an account of the genus Scrophularia preparatory to the compilation of a monograph. The last survey of the genus Scrophularia was prepared by Bentham for De Candolle's Prodromus, since which time the species have almost doubled in number, mainly owing to plants collected in Persia, China, and Tibet. The author is of opinion that the genus is in an early stage of development. He fails to find a natural group character in the absence of a staminode, and bases his primary divisions on the habit, *i.e.* whether the plants are herbaceous or shrubby with well-developed leaves or xerophytic undershrubs with scanty leafage.

A SKETCH of the flora and plant formations of the Kermadec Islands, contributed by Mr. R. B. Oliver to the Transactions of the New Zealand Institute (vol. xlii.), is the outcome of a visit for eleven months to Sunday Island and flying visits on the way home to the three smaller islands. Several species are added to the flora, bringing up the total to 114 ferns and flowering plants. The author makes a new species of a smooth-stemmed lofty tree fern, *Cyathea kermadecensis*, separating it from another endemic species, *C. Milnei*, that has a short, rough stem. The forest formations are the most extensive and important. The dry forest shows three tiers of vegetation; the topmost consists almost entirely of trees of *Metrosideros villosa* about 60 feet in height; smaller trees such as *Rapanea kermadecensis*, *Myoporum laetum*, the palm *Rhopalostylis Baueri*, and *Cyathea Milnei* form the next tier, while *Pteris comans* supplies the ground vegetation in many districts. The other Cyathea, characteristic of wet zones, in one locality forms a forest as lofty as the Metrosideros. The author proposes to include the Kermadecs, with Lord Howe and Norfolk Islands, in a "subtropical islands' province" of the New Zealand region.

THE *Rassegna Contemporanea* for September contains two articles of scientific interest. One is the speech given by Cannizzaro at the complimentary banquet at Rome on the occasion of his receiving the Copley medal of the Royal Society, a copy having been preserved along with his copious scientific and political correspondence. A photograph of part of the manuscript is also reproduced. Another article, by Riccardo Dalla Volta, deals with the International Agricultural Institute recently founded to collect agricultural statistics on an international basis. There is a useful field of work in this direction. The methods of collecting statistics and of crop reporting vary considerably in different countries, and any organisation that makes for greater uniformity is to be welcomed.

THE Agricultural Department of the Transvaal is continually suggesting new crops and new industries to farmers, and in a recent issue of its Journal (vol. viii., No. 32) one of its experts discusses the possibility of raising ostriches. The best feathers are only produced when the birds are sufficiently nourished, and a good supply of food is therefore necessary. Lucerne is so valuable a food that wherever it can be grown the birds may be expected to thrive; about 40 lb. of the green crop or 10 lb. of the hay is taken by an ordinary ostrich weighing from 250 to 300 lb. If maize or other concentrated food can be supplied less lucerne becomes necessary, and a larger number of birds can be kept on a given area. A number of districts are indicated where ostriches might be expected to do well.

IN the meteorological chart of the North Atlantic Ocean for November, published by the U.S. Weather Bureau, Prof. W. L. Moore points out that this month marks the beginning of the stormy season over the Transatlantic routes. For the purpose of illustrating the general behaviour of the storms, instructive synoptic weather charts are drawn for each day from November 11–16, 1909, inclusive, showing a typical case. The storm in question originated in high northern latitudes, and moved in a more or less easterly direction from Newfoundland to the north-east of the Azores. The chart for November 16 shows that the barometric depression had deepened and increased in size until the entire eastern part of the ocean was affected by the storm area. It also shows that a second barometric depression, apparently an offshoot of the central system, had formed about 500 miles north-westward of the Azores, which gave rise to severe weather along the northern shipping routes. Its approach to the British Islands seems to have been checked by the high-pressure system prevailing there.

SNOWFALL in the Transvaal is a somewhat exceptional occurrence; so far as can be ascertained, there have been only eleven years out of the last fifty-seven (1853–1909) in which it has been recorded. On two occasions, 1903 and 1904, the falls were very slight, and none was experienced during 1905–8 inclusive. The *South African Journal of Science* for September contains an interesting article on the subject by Mr. H. E. Wood, of the Transvaal Meteorological Service, with special reference to the heavy storm of August 16–18, 1909. Although a rather heavy fall occurred at Johannesburg in May, 1892, the fact of the town being covered to a depth of several inches on the morning of August 17 was such an unusual event, especially for the younger generation, that the day was celebrated as a general holiday. The maps of the distribution of atmospheric pressure show that the snowfall was associated with the rapid approach of a high-pressure system towards a region over which low pressure had previously existed. In the author's experience it has always been found that any widespread rainfall over eastern South Africa is connected with a rising barometer.

PROF. A. PIUTTI has sent us an abstract of a paper by him, read before the Royal Academy of Naples, on the absorption of helium in salts and minerals. Prof. Piutti has been able to detect helium in the gases extracted from borax and other salts, which have been melted and then suddenly chilled while a current of air has been bubbling through them. This experiment he regards as throwing doubts on Prof. Strutt's conclusions on the measurement of geological time from radio-active data. It is urged that helium may have been absorbed by the molten material of the igneous minerals, either from the atmo-

sphere or from gases existing in the interior of the earth, and that similar processes may even have occurred in the sedimentary rocks.

THE third part of *Terrestrial Magnetism and Atmospheric Electricity* for the present year contains two valuable tables of corrections to the British Admiralty, the German Admiralty, and the United States Hydrographic Department magnetic charts of the North Atlantic, by Dr. L. A. Bauer and Mr. W. J. Peters, based on the observations made by the magnetic ship *Carnegie* during her recent cruise. Over almost the whole area the three charts show too low values for the west magnetic declination, the error being generally less than a degree, but in some cases it is nearly 3°. As the error is in the same direction for 5000 miles, it may result in a serious error in the position of a vessel at the end of a voyage. The corrections to the dip are not always of the same sign; their average magnitude is nearly 2°, and the actual amount in one case exceeds 4°. Over most of the region the values of the horizontal intensity given in the charts are too high by 8 units in the third decimal, C.G.S. units.

A NEW electric generating station was opened on October 12 at the Northampton Polytechnic Institute. The plant was supplied by Messrs. Siemens Brothers Dynamo Works, Ltd., chiefly for instructional purposes as an example of the latest ideas in central station practice, and comprises electrical apparatus for alternating- and for continuous-current working. The buildings of the polytechnic are sufficiently large to present experimental facilities on an engineering scale for most of the problems which have to be handled in larger stations. It is intended to run the station on a thoroughly commercial basis; the coal, wages, and other expenses will be strictly charged up, and every unit of electrical energy supplied for the purposes of the work of the polytechnic will be metered regularly and sold to it. The senior students, with the help of the technical staff, will take charge of this work. The main features of the plant are two gas-driven sets, each consisting of one continuous-current generator and one high-voltage alternator in tandem. The polytechnic authorities have issued for the use of intending students and others a full and well-illustrated description of the details of the whole plant, including gas-engines, suction gas-producer plants, alternators, motor-generator set, switchboards, transformers, and so on.

COMMENTING on the *Atlantic* airship voyage, the *Engineer* for October 21 does not pretend to any regret that the attempt has been an unqualified failure. Nothing of any value could have been expected from such a voyage arranged for spectacular purposes only. Enough, and more than enough, has been done to make the conquest of the air spectacular. If flight in its varied forms is to rise above the level of a mere sport, it is time that a little steady humdrum, useful work was entered upon, and that the praise of the public and the winning of prizes were forgotten. Much remains to be done, and it is well that it should be done steadily and scientifically by honest spade-work, and not under the glamour of popular sensationalism.

THE successful launch of the White Star liner *Olympic* at Belfast on October 20 gives occasion for a long illustrated article in *Engineering* for October 21. With a total weight of 27,000 tons, it can be understood that very careful provision had to be made to ensure the successful floating of the ship. The standing ways were about 800 feet long and the sliding ways about 700 feet long. The ship overhung the cradle aft to the extent of 80 feet, and forward to about 50 feet. The average pressure on the ways was only just above 3 tons per square foot. The declivity of the ways forward was $\frac{3}{8}$-inch per foot, and aft $\frac{1}{2}$-inch per foot. On the occasion of the launch the weather was perfect, with a slight stern wind. The pressure on the hydraulic ram of the trigger arrangement was 435 tons, and on this being released the ship moved at once, the hydraulic starting jacks not being used. The time taken was sixty-two seconds, and the maximum speed attained was 12$\frac{1}{2}$ knots. When brought to rest, the bow of the vessel was 500 feet from the end of the ways. Messrs. Harland and Wolff deserve most hearty congratulations on their success, this success being due, in a large measure, to the minuteness and precision with which every detail connected with the operation had been anticipated.

A BOOK on "English Philosophy," by Mr. Thomas M. Forsyth, is shortly to be issued by Messrs. A. and C. Black. Its aim is to give an outline of the development of English philosophy from Bacon to the present day.

ERRATUM.—The author of the review of Prof. Seward's "Fossil Plants" in NATURE of October 20 writes:—"May I point out a slip, for which I am responsible, in my review? On p. 491, column 1, Arber and Parkin should be Arber and *Thomas*."

OUR ASTRONOMICAL COLUMN.

A BRILLIANT METEOR ON OCTOBER 23.—Mr. W. F. Denning writes:—"A splendid meteor was seen by Mr. J. E. Clark at Purley, Surrey, on October 23, at 8h. 12$\frac{1}{2}$m. It shot slowly from 52°+34° to 72°+40°, and left a streak for six seconds. The flight was directed from a radiant in the head of Aries, and the duration was four seconds. From Lincolnshire and the eastern counties the meteor must have appeared a magnificent object, and further descriptions of its apparent course will be very useful to aid in determining the real path above the earth."

SIMULTANEOUS PHOTOGRAPHIC OBSERVATIONS OF A REMARKABLE METEOR.—Herr Sykora, in No. 4447 of the *Astronomische Nachrichten*, gives particulars of the path of a bright meteor, of which the trail was photographed at three different stations, Taschkent, Iskander, and Tschimgan, on August 11, 1909. The brightness of the meteor varied considerably during the flight, and as the knots and outbursts are similarly shown on all three photographs, it has been possible to determine the heights at which they occurred. The first part of the trail, then very faint, began at 112 km., and suddenly brightened up at 97·7 km.; then there were marked outbursts at 88 and 85 km. respectively, with a sudden falling off at 83 km. At 81 km., however, a sudden recalescence occurred, and final extinction took place at 80·7 km. The radiant was found to lie in the position $\alpha=44{\cdot}0°$, $\delta=+56{\cdot}9°$.

TWO REMARKABLE PROMINENCES.—No. 2, vol. xxxii., of the *Astrophysical Journal* (September, p. 125) contains a note, by Dr. F. Slocum, describing two remarkable prominences photographed with the Yerkes spectroheliograph during March and April.

One of these was remarkable for the lengthy period of its existence, the other for its extreme activity and brief existence. The former was first seen disappearing over the western limb of the sun on March 4, but reappeared, larger and transformed, on March 16; it was last photographed on April 28. On March 18 the prominence extended from latitude −20° to +25°, and its longitude was about 70°; throughout its existence, of probably about 55 days, the southern limit was practically constant, but the northern limit varied considerably. The recorded apparent height varied between 77,000 km. (March 18) and 12,000 km. (April 1); when last photographed (April 28) the height was 61,000 km., but prominence plates secured on May 11, 12, 13, and 14 showed no trace

of the outburst. A number of photographs, in H_2, calcium, light are reproduced in the journal, and it is stated that visual observations on April 13 showed the prominence to have the same form and size in the radiations Hα, Hβ, and D_3.

The other prominence was first noticed on a plate taken at 7h. 46·7m. G.M.T. on March 24. It was then conical in form, with a base extending from position-angle 230° to 235°, and an apparent height of 46,500 km. On a photograph taken March 25, at 2h. 54·9m., the prominence had assumed a rugged tree-form, with the trunk in position-angle 229·7°, and the height was 75,500 km. Then a rapid increase of height set in, and by 5h. 55·4m. the greatest altitude shown on the plate was 319,500 km. (nearly 200,000 miles), but the top of the glowing mass was beyond that. The greatest motion was observed between 4h. 56·1m. and 4h. 57·9m., during which period 11,600 km. were covered at a rate of 107 km. (66·8 miles) per second. This increase of height occurred in two ways, first by actual growth and then by detachment from the limb and the upward motion of the complete mass. At 7h. 43·3m. there was no trace of the prominence, which had apparently vanished upwards, and Dr. Slocum suggests that this floating away, rather than subsidence, is characteristic of eruptive prominences.

THE RELATIONS BETWEEN SOLAR AND TERRESTRIAL PHENOMENA.—In No. 4, vol. viii., of *Scientia* Abbe Th. Moreux has a long article (pp. 279–305) dealing with the connections between solar phenomena and terrestrial meteorology, more especially rainfall. He points out that as yet the science is in its infancy, that we are still unable to forecast scientifically, and then proceeds to show, by an excellent review of what has already been done, what progress has been made and what hopes for the future are well founded. The labours of Herschel, Schwabe, Wolf, Norman Lockyer, Meldrum, Chambers, Brückner, Stone, Balfour-Stewart, W. J. S. Lockyer and others, are discussed, and it is shown that a gradual progress in the collection of data and the correlation of phenomena has taken place. A fitting tribute is paid to the English Government for the installation of the Solar Physics Observatory, and the related observatories in India and Mauritius.

Finally, M. Moreux suggests that the excessive floods and rainfall of the present epoch are in accordance with precedent, heavy precipitation following the spot activity of 1905-7, and he suggests that the outlook for the future, in the matter of establishing laws which will warrant forecasting, is hopeful.

SEARCH-EPHEMERIDES FOR WESTPHAL'S COMET, 1852 IV.—Three search-ephemerides for Westphal's comet are given by Herr A. Hnatek in No. 4447 of the *Astronomische Nachrichten*; each ephemeris covers the period November 1, 1910, to January 30, 1911. As the period of the comet is uncertain, these three ephemerides are given, based on elements which give it as 60, 61, or 62 years respectively. The declinations are all between 56° and 60° south, and the computed magnitudes range from 13·1 to 14·8.

THE INTERNATIONAL CANCER CONFERENCE AT PARIS.

THE first International Conference on Cancer was held in Heidelberg in 1906 under the auspices of the German Cancer Committee, on the occasion of the opening ceremony of a cancer hospital and laboratory erected and equipped through the efforts made by Prof. v. Czerny, the distinguished surgeon. Out of that conference there developed an International Association for the Study and Suppression of Cancer, modelled on the lines of the International Association for the Suppression of Tuberculosis. This body, together with the French Association for the Study of Cancer, was responsible for the second conference, held in Paris on October 1–5 under the patronage of the President of the Republic. M. Doumergue, the Minister of Public Instruction, presided over the opening ceremony, attended by 150 delegates, including official representatives of the twenty-three foreign Governments. Dr. E. F. Bashford, director of the Imperial Cancer Research Fund, represented the British Government.

In his opening remarks M. Doumergue, after directing attention to the reunion of the nations in spontaneous congresses for the relief of physical, social, and moral miseries as a characteristic of the present age, pointed out the significance of the unanimity of these humanitarian endeavours, enlarged upon the advantages accruing from exchange of views and from the dissemination of discoveries, and asserted the futility of isolation. In his opinion the publicity obtained for the proceedings of such conferences is bound to bear fruit in a profitable collaboration between the medical profession, the public in general, and patients suffering from cancer.

Prof. von Czerny, the president of the conference, then addressed the delegates, and was followed by Prof. Bouchard, president of the French association, and Prof. Landouzy, dean of the faculty of medicine. Each surveyed the cancer problems from different points of view, the question of parasitic etiology, the alleged increase of the disease, and the possibilities of surgery, radium, and electrotherapeutics being discussed by von Czerny. Landouzy took more the point of view of the physician, seeing in much of the work that had been done on immunity indications of ultimately obtaining a curative serum. The foreign delegates were afterwards called upon.

The scientific papers were grouped in six sections:—(1) histology and histological diagnosis; (2) statistics; (3) clinical diagnosis; (4) treatment; (5) etiology and experimental pathology; (6) comparative pathology. Section (1) appointed a committee to draw up an international nomenclature of new growths. The discussion on statistics and statistical methods revealed strong criticism of the methods and results expounded by Prof. George Meyer, of Berlin, and no progress was made towards the compilation of comparable international cancer statistics. The papers in Section (3), on clinical diagnosis and on the chemistry of cancer, showed that serum diagnosis could not be trusted to replace older methods. The papers on treatment were followed by important discussions on the value of aids to surgical treatment, *e.g.* fulguration, X-rays, radium.

Little was said in favour of fulguration. The employment of radium was very fully discussed. Few of the speakers were prepared to employ it in other than small superficial lesions without previous resort to surgery; although many speakers had employed radium, they appeared to be of the opinion that they had in their possession quantities too small to permit of satisfactory conclusions as to its ultimate value. In Section (5) von Dungern, of Heidelberg, gave an account of the immunity reactions to transplanted cancer; he confirmed the conclusions of the Imperial Cancer Research Fund to the effect that the phenomena in question were due to the artificial induction of active resistance or "active" immunity to the cancer cell. Dr. Fichera had applied the results obtained by immunising animals with normal tissues to the treatment of cancer in man. He claimed to have caused the disappearance or reduction in size of true malignant new growths. Dr. Borrel described the evidence he had collected bearing on the possibility of Cestodes and Demodex fulfilling the part of carriers of a hypothetical cancer virus. Dr. Borrel's cautious statements called forth a vigorous criticism on the part of Durante. In the section of comparative pathology Prof. C. O. Jensen described tumours occurring on beets; no causative parasites were found in them. These tumours had been transplanted into other beets. From their general biological behaviour he very cautiously inclined to regard them as analogous in the vegetable kingdom to cancer in the animal kingdom.

The delegates were entertained in the most hospitable and attentive manner, both officially and privately. Much of the time officially devoted to discussion was absorbed by what were really new unannounced contributions, and, apart from the discussions on clinical matters and on treatment, very little serious discussion took place in the official sittings. This shortcoming was, to some extent, compensated for by the willingness of the delegates to discuss their respective points of view in private intercourse; nevertheless, purely scientific and theoretical questions suffered by being crowded out by matters assumed

to be of more pressing importance from the point of view of the lay public.

As in the opening ceremony, so also in the closing ceremonies, interest centred round the utterances of Dr. Bashford with reference to the attitude of Great Britain towards the International Association, the organisation and proceedings of which have, in the past, not met with unanimous approval. The abstention of Great Britain from membership of the International Association was possibly in M. Doumergue's mind during his opening remarks, and was unambiguously referred to at that ceremony by Dr. Bashford, who explained that in Great Britain the opinion is held that the time is hardly ripe for congresses concerning a disease of which so little is known as cancer, and which, at present, it is impossible to prevent, there being at the same time nothing revolutionary for such conferences to agree upon or to discuss. What is wanted at present is rather an army of independent active workers, for, as in the past in regard to other matters, so in the future with regard to cancer, advances in knowledge are to be expected from individual investigation rather than from the deliberations of national committees or international conferences. Still, workers in Great Britain have done all that is practicable to further international intercourse and collaboration, and will do so in the future.

In his closing remarks von Czerny, as president, expressed the hope that the objections to the organisation and assumed functions of the International Association will be removed before the conference is again called together, probably in Dresden in 1913.

It may be recalled that the proposal to hold a second International Conference in Paris was made after a proposal to hold the first International Cancer Congress in London had been rejected by responsible persons in this country.

REPORTS OF METEOROLOGICAL OBSERVATORIES.

BREMEN, "*Meteorological Year-book*" (1909).—This volume, the twentieth of the series, gives a short monthly summary of the weather, observations thrice daily (in the form adopted by the International Committee), two-hourly readings of the self-recording instruments, and monthly and yearly *résumés*. The results for earth temperature at various depths (0–300 cm.), evaporation, solar and terrestrial radiation, &c., for a number of years are shown both graphically and in tabular form. The curves of duration of sunshine, evaporation, and solar radiation all exhibit a similar and peculiar kink from July to August. Dr. Grosse points out that, whereas Hann considers that evaporation is most intimately connected with temperature, he (the author) thinks it is more closely connected with the duration of sunshine. The rainfall at Bremen is greatest between June and October inclusive; July has a decided maximum.

Liverpool Observatory (1909).—The Mersey Docks and Harbour Board, which maintains this important institution in the interest of navigation, has caused a second seismometer to be erected under Prof. Milne's supervision, and some devices of great delicacy were introduced in order to solve certain problems connected with the physics of the earth's crust. The instrument has not been long at work, but it is said that the records indicate clearly a deformation of the surface due to the load of tidal water in the Mersey estuary. We have before pointed out that the automatic meteorological instruments include anemometers designed by Osler, Robinson, and Dines respectively; the tables show for each day the velocities recorded by the Dines' instrument, the horizontal motion of the air, and the extreme pressure on the square foot—in addition to the direction. The mean temperature of the year (mean of maximum and minimum), 48·1°, was 1° below the average; the absolute maximum, 76·4°, occurred in May, and was 12·7° below the highest record; the minimum was 22·3°, in December, 13·8° above the lowest record. The rainfall, 28·45 inches, was very slightly below the normal.

Royal Alfred Observatory, Mauritius (1909).—From tables showing the means and extremes of the principal meteorological elements, it appears that the mean temperature of the year was 72·9° as compared with the average, 73·4° (1875–1905); mean of daily maxima 80·4°, minima 66·7°; absolute maximum 89·3°, in December; minimum 54·7°, in July. Maximum in sun's rays 163·4°, in January; minimum terrestrial radiation 45·7°, in May. Rainfall, 47·83 inches, as compared with an average of 47·95 inches; the principal feature was a total excess of 11·23 inches above the normal in June and July. The rainfall of June was the greatest on record in all parts. The annual amount for the whole of the island (mean of seventy-two stations) was 90·50 inches, as compared with an average of 82·37 inches. During the year eight cyclones occurred in the South Indian Ocean; tracks of six of them in January and March are given. The mean magnetic declination was 9° 16·34′ W. The magnetic disturbance which occurred on September 25–26 was the greatest on record, the total movement in horizontal force being 0·00650 C.G.S. unit. Photographs of the sun were taken daily when weather permitted, and 103 negatives were forwarded to the Solar Physics Committee.

Transvaal Meteorological Department (1908–9).—The number of stations reporting to the Johannesburg Observatory during the year ended June 30, 1909, was 599, an increase of fifty-two since the last report; these are mostly rainfall stations. The year was the wettest since accurate statistics have been collected, but several such rainy seasons will be required before the springs can regain their former activity. The average for the whole colony was 40·6 inches, on eighty-three days; the greatest rainfall was on the eastern slope, in the Leidenburg district, where more than 109 inches on 133 days were recorded. Maps are given showing (1) the rainfall for 1908–9, and (2) the mean for the last five years; the latter shows that only the eastern part of the colony has an average of more than 30 inches. No snowfall was reported by any station, but some was seen on the hills on August 21, 1908. The meteorological tables include hourly or two-hourly readings at Johannesburg and Pretoria. Daily weather forecasts are issued, and are exhibited at all postal telegraph offices. The Johannesburg Observatory is well provided with self-recording instruments, and it is expected that a set of Wiechert's instruments for recording earthquake phenomena will be shortly installed; at present the department distributes and collects postcards giving particulars of any earthquakes noticed.

Deutsche überseeische meteorologische Beobachtungen (*Heft xviii.*).—As in several past years, this very valuable series of observations has been published by the Deutsche Seewarte, with the assistance of the German Colonial Office. The present volume includes monthly and yearly summaries of the stations under the control of the Seewarte, also observations at the imperial observatory at Tsingtau and affiliated stations, and those made in East Africa, some of which are printed *in extenso*. The data refer mostly to 1908, with a few arrears, and useful references are given in many cases as to where the earlier observations may be found. We note in the Acta (1909) of the Solar Commission of the International Meteorological Committee, which proposes to publish certain meteorological data for the whole globe in a condensed form, that the German oversea observations will be turned to good account. The headquarters of the commission (of which Sir Norman Lockyer is president) are at present in London, in connection with the Solar Physics Observatory at South Kensington.

TREES AND TIMBER.

THE difficulty of identifying timbers exported from partially explored countries is only too well known, so that any attempt to arrange an authentic collection of specimens of tropical timbers deserves recognition. With this object, Dr. M. Büsgen has placed on record in the *Mitteilungen aus den Deutschen Schutzgebieten* (vol. xxiii., part ii.) the distinguishing characters of the trees noted on an expedition through the German Cameroons, and has published a series of figures illustrating sections

of representative timbers, of which original specimens are stored at the Forestry College in Münden. The author records a preponderance of species for the families Leguminosæ, Apocynaceæ, Euphorbiaceæ, and Moraceæ. Among the more important trees are *Chlorophora excelsa*, apparently identical with African teak; *Enantia chlorantha*, a yellow-wood; *Entandophragma Candollei*, a source of mahogany; *Lophira alata*, known as ironwood; and *Mimusops djave*, that furnishes Congo mahogany.

In connection with the economic side of Indian forestry, Mr. R. S. Troup has prepared reports on the fissibility of some Indian woods and the prospects of the match industry in the Indian Empire, the former published in the Indian Forest Records (vol. ii., part ii.), the latter in the Indian Forest Memoirs (vol. ii., part i.). The experiments on fissibility indicate that splitting depends mainly on the nature of the grain, and that a hard wood with straight grain, such as *Acacia catechu*, splits more readily than a cross-fibred soft wood, such as *Bombax malabaricum*. Tests were also made to compare the cleaving force required in tangential and radial planes, with the result that for most timbers cleavage proved to be easier in the tangential plane. The memoir on match woods is very comprehensive, and sets out the results of practical manipulation with different woods, suitable locations for factories, the possibility of obtaining supplies, and an article on the manufacture of matches. Species of poplar, willow, and alder—the trees that yield wood used in European factories—are found in parts of India, but not in sufficient quantity. Fortunately, a number of Indian trees yield suitable wood, amongst which *Bombax insigne* and *B. malabaricum* are expected to furnish the bulk of supply.

An article in the *Kew Bulletin* (No. 6) on new trees and shrubs, contributed by Mr. W. J. Bean, refers with one exception to Chinese introductions. Three conifers are described: *Larix Potaninii*, a larch attaining a height of 70 feet; *Picea complanata*, a flat-leaved spruce; and *Tsuga yunnanensis*. Of the dicotyledons, a pinnate-leaved species of Syringa is a novelty collected by Mr. Wilson for Messrs. Veitch; *Pyrus Folgneri* is an attractive horticultural addition to the genus, and *Meliosma Veitchiorum* possesses both morphological and horticultural interest, as it is the only tree in the family Sabiaceæ hardy enough for outdoor cultivation in this climate, and promises to be a most ornamental acquisition to the garden. Considerable interest attaches to a revision of the genus Entandophragma communicated by Mr. T. A. Sprague, because various species of the genus, and the allied genera Pseudocedrela and Swietenia, are important sources of timber.

SELECTIONS FROM AMERICAN ZOOLOGICAL WORK.

NATURE for 1908, vol. lviii., p. 140, contained an illustrated account by Mr. N. H. Corquodale of a pair of hartebeest horns attacked by a tineid larva. Another instance of antelope horns—in this instance those of a waterbuck—being attacked by such larvæ is illustrated by Mr. A. Busck in vol. lvi., No. 8, of Smithsonian Miscellaneous Collections. The author claims to have shown the nature of the larval tubes—apparently the work of *Tinea vastella*—more distinctly than has been done before.

The *spolia* of the Smithsonian Expedition to East Africa continue to afford the bases for new work, among which we may refer to a description by Mr. W. H. Dall, in No. 10 of the volume just cited, of three new land-shells, two referable to Buliminus and the third to Limicolaria.

It is always satisfactory when two or more observers arrive independently at the same conclusion. An instance of this is afforded in a paper on chimæroid fishes by Messrs. Bean and Weed, published in Proc. U.S. Nat Mus., No. 1723, where the authors come to the conclusion that the Japanese species described by Mr. S. Tanaka under the new generic title of Anteliochimæra is not separable from the long-beaked chimæras of the genus Harriotta, a view which had been previously adopted by Messrs. Holt and Byrne, although this was unknown to the authors until their paper was in type. Excellent figures are given of the typical *Harriotta raleighana*.

In this connection it may be mentioned that the part of the Journal of the College of Science of Tokyo University containing Mr. S. Tanaka's description of the so-called Anteliochimæra has only lately been received, although it is dated October, 1909.

Among papers relating to the North American fauna, mention may be made of Messrs. Meek and Hildebrand's list of fishes inhabiting the lakes, rivers, and lagoons of the Chicago district, issued as No. 9 of vol. vii. of the Zoological Publications of the Field Museum. Special interest attaches to the fish-fauna of the district owing to the changes caused by the growth of the great city; and it is hoped that the paper will lead to careful study of these changes, as well as to observations on the distribution and habits of the various species.

In another faunistic paper, Proc. U.S. Nat. Mus., No. 1719, Mr. D. Coquillett supplies a list of the type-species of North American genera of Diptera, a subject which comes very opportunely at a time when so much attention is being devoted to the biting flies of the world. That there was need for revision is exemplified by the statement that a certain fly, *Tachina vulgaris*, has been redescribed and renamed 257 times, one writer alone having made from it 245 species, arranged in five genera; this being only one—it may be hoped the worst—out of many cases. The author carries priority in nomenclature to the bitter end, a matter of less moment in this than in many other groups.

Perhaps the most important of all the papers in the batch on which these notes are based is one by Mr. A. H. Clark (Proc. U.S. Nat. Mus., No. 1756), on *Proisocrinus ruberrimus*, a new genus and species of stalked crinoid from the Philippines. The new form is by far the tallest existing member of the group hitherto discovered, the height, exclusive of the root, exceeding 40 inches. In colour it is brilliant scarlet, thereby differing from the purples and greens of the Pentacrinidæ, and the yellows of the Apiocrinidæ and Bourgueticrinidæ. The family position of the new genus is still uncertain; the general structure of the calyx and arm-bases recalling Bathycrinus, while the arms and pinnules are of the type of those of the Pentacrinidæ, although most of the stem resembles that of Calamocrinus. There is also an approximation—apparently more than superficial—to Millericrinus.

In No. 1759 of the aforesaid Proceedings Mr. J. A. Cushman describes a collection of arenaceous Foraminifera obtained by the *Albatross* during her recent cruise in the Philippines. Ten species and one genus (Sphærammina) are believed to be new. In the new genus the test consists of a series of spheroidal or ovate chambers arranged on a straight axis, with the one last formed envleoping the rest. In several respects it recalls the Miocene *Ellipsoidina ellipsoides*.

R. L.

DISTRIBUTION OF WEEDS.

THE numerous means by which nature ensures the distribution or dispersal of seeds of wild plants are well known to students of botany. For example, some seeds (Papaver, Orobanche) are very light and easily scattered by the wind; others (Cnicus, Senecio, Rhinanthus) bear flight organs or "wings," by means of which they sail away on the breeze; some seed vessels are so constructed that on ripening and opening they throw out the seed with considerable force (Lupinus); while some fruits bear hooks, by which they become attached to animals and man, and so secure distribution (Galium, Arctium). Unhappily, many serious weed pests are also distributed by man in agricultural and horticultural seeds and various other means, and doubtless many botanists have read of the emigrant Scotchman who, in the pride of his heart, took specimens of the national emblem to Australia, and so introduced a very harmful weed.

A few months ago an advertisement, resembling a paper butterfly, was widely distributed, and, probably for realism and novelty, it was made to bear the burr of the burdock (*Arctium Lappa*). This advertisement doubtless received attention owing to the fact that recipients attached it (by the "burrs") to the clothing of other members of the household! It appears that the same method has been utilised—perhaps by the same advertisers—in Australia,

and the following extract from the *Agricultural Gazette of New South Wales* (August 2) is of interest:—"The Chief Quarantine Officer for Plants has informed the Under-Secretary for Agriculture of a most extraordinary method whereby an objectionable weed might be broadcasted throughout the State. It appears that, as an advertising medium, some printed paper, representative of a flying insect, has been sent to Australia, and the genius who invented this particular style of advertisement, in an endeavour to make it more realistic or uncommon, had attached to each specimen the burr or seed of the noxious weed 'Burdock' (*Arctium Lappa*). The authorities in Western Australia had called the attention of the Director of Quarantine to the use to which the burr of this noxious weed was being put. It is needless to say that business firms stopped the issue of the advertisement under notice as soon as they knew there was a serious objection to its use."

Burdock is a very troublesome weed, and it is clear that our colonial friends have to be on the alert if they are to prevent the introduction of new plants in the manner outlined.

THE LANCASHIRE SEA-FISHERIES LABORATORY.

THE eighteenth report of the Lancashire Sea-Fisheries Laboratory (for the year 1909) contains an account of work carried out at the University of Liverpool, at the sea-fish hatchery at Piel, and at the Port Erin Biological Station. Mr. James Johnstone describes five species of internal parasites of fishes from the Irish Sea, the three genera discussed being Lebouria, Prosthecobothrium, and Echeneibothrium. The same author reports on the measurements of some 55,000 plaice from the district, curves representing the frequency of fish at each unit of length for the most important fishing grounds being given. The average weights of plaice at each unit of length from various fishing grounds have also been determined. Taking Heincke's formula $w = \frac{l^3}{100}k$ where w is the weight in grams and l the length in centimetres, the monthly variations in the value of k have been calculated for several of the grounds. The value shows a maximum in July, and the minimum appears to be in January, at which time of the year very little food is found in the stomachs of the plaice.

A considerable section of the report is occupied by papers on hydrographical work done in the Irish Sea by Mr. Johnstone and Dr. H. Bassett. It is doubtful, however, whether the comparatively slender data contained in the papers of the latter writer can be usefully employed in the way suggested by him, in connection with the prediction of climatic conditions over extended periods of time. Very much more research will be necessary before such predictions can have any but a speculative value.

The report concludes with a paper by Prof. Herdman, Mr. A. Scott, and Mr. Dakin on plankton work carried out off the Isle of Man in 1909. The paper as a whole tends to confirm the doubts, which have often been expressed, as to the value of the quantitative methods of plankton work, as at present practised. Until some trustworthy instrument has been devised for accurately measuring the quantity of water which has passed through the net on each occasion, the elaborate methods of counting the organisms captured would hardly seem to repay the time which must necessarily be employed upon them.

ZOOLOGY AT THE BRITISH ASSOCIATION.

THE attendance of zoologists at the meetings of Section D was affected by the fact that the International Congress of Zoology at Graz and the International Congress of Entomology at Brussels had taken place so recently. These meetings abroad were probably responsible for the absence of a few of those who in previous years have contributed papers to the section. The programme, being a little less crowded than usual, was taken at a more comfortable pace, and reasonable time was available for discussion and remarks on the various subjects under consideration. The attendance at the meetings of the section was very satisfactory, especially in the circumstances, and the interest in the proceedings was fully maintained to the end; indeed, the concluding meeting was one of the best of the series.

Coral Snakes and Peacocks.

The popular lecture, which for several years has been a feature of the programme of the section, was given before a large audience by Dr. H. F. Gadow, F.R.S., who chose for his subject "Coral Snakes and Peacocks," and illustrated his remarks by a series of lantern-slides in colour. He first described some of the physical features of Mexico, during a visit to which country his observations on coral snakes (Elaps) were made. The red, black, and yellow markings of these snakes have been said to be of the nature of "warning coloration," but Dr. Gadow pointed out that, although the markings are conspicuous when the snakes are lying in a dish or other vessel, the colours commingle, especially in the dusk, with the natural surroundings of the animal, so that it becomes very inconspicuous. Coral snakes are entirely nocturnal in habit; they lie in hiding during the day, so that the explanation of their coloration as "warning" is unwarrantable. Many harmless snakes are coloured in a similar manner to the coral snakes, *e.g.* among a large collection of Coronella from various places in Mexico examples of one species were found which seem to have "mimicked" several of the colour patterns exhibited by species of Elaps. But Dr. Gadow pointed out that the specimens of Elaps and Coronella found in the same locality do not exhibit the same colour pattern. Dr. Gadow's conclusion, stated briefly, was that the resemblances in colour pattern between Coronella and Elaps are instances of pseudo-mimicry. In the second part of his address Dr. Gadow traced the gradual transition from a comparatively simple feather with light and dark bands to the "eyed" feather, with fully developed metallic lustre, of the mature peacock's "fan." He then described the retrogressive changes leading from the "eyed" feathers to the modified feathers of the back and margin of the "fan."

Coccidia and Coccidiosis in Birds.

Dr. H. B. Fantham described his observations on the life cycle of the sporozoon *Eimeria* (*Coccidium*) *avium*, which produces a form of "enteritis" in grouse, fowls, and pheasants, especially in young birds. Resistant oöcysts of the parasite are voided in the fæces of the infected birds, and are acquired by other birds in their food or drink. A mature oöcyst contains four sporocysts, in each of which are two active motile sporozoites. After the oöcysts have been swallowed by a bird, the cyst wall is softened by the pancreatic juice, the sporozoites creep out and penetrate the epithelial cells of the duodenum, in which they become rounded and grow, feeding passively on the host cell. After attaining a certain size, the nucleus and protoplasm of the parasite—now a schizont—divides into a cluster of merozoites arranged *en barillet*, *i.e.* like the segments of an orange. Very little residual protoplasm remains after the formation of merozoites. These small, vermicular merozoites glide away and invade other cells, within which they grow to schizonts and multiply. A number of generations of merozoites is produced in this way, and the destruction of the epithelium and the derangements resulting therefrom in some cases cause death of the host. In most instances some merozoites pass down into the cæca, where they grow and multiply, producing intense inflammation. Sooner or later a limit is reached, both to the power of the bird to provide nourishment for the parasites and to the multiplicative capacity of the parasite itself, and then sexual forms are produced. Some of the organisms become large and contain much reserve food material. These are the macrogametocytes, each of which, after the maturation changes, becomes a single macrogamete. Slightly smaller parasites, with little or no reserve material, undergo nuclear multiplication and give rise to many minute biflagellate microgametes, which disperse and swim away in search of macrogametes. Each of the latter has precociously invested itself with a cyst wall, in which a micropyle is

left for the entry of the microgamete. One microgamete only fuses with the macrogamete, and then the oöcyst wall is completed by closure of the micropyle. This series of changes, from infection to the formation of oöcysts, extends over about eight or ten days in the grouse. At first the oöcysts are uninucleate, and their contents completely fill them; later the contents concentrate into a spherical mass, the nucleus divides into four, around each of which the protoplasm aggregates, forming four round sporoblasts. Each sporoblast develops into an oval sporocyst, in which two sporozoites are formed. The oöcysts, when dropped, are very hardy; some which had been taken from a moor a year previously were found to be still alive.

Coccidiosis is accompanied by an increase in the number of polymorphonuclear leucocytes in the blood of the host, together with a decrease in the number of the erythrocytes. Young birds are much more susceptible to coccidiosis than older ones, but older birds which have become "chronics" serve as reservoirs of oöcysts, and are constant sources of infection. Lime dressing of the soil, which destroys oöcysts, is the most effective treatment at present known for combating coccidiosis.

The Formation and Arrangement of the Opercular Chaetae of Sabellaria.

Mr. Arnold T. Watson contributed an account of the opercular chætae of *Sabellaria alveolata*. The operculum, with which this tube-building polychæte defends the opening of its tube, consists of two crescent-shaped structures, each of which is composed of three concentric rows of paleæ, of characteristic form, borne at the distal extremity of the peristomial lobe. Viewed from above, the exposed portions of the paleæ of the outer and middle rows are seen to be arranged in an imbricated manner, their free ends directed outwards, while the free ends of the paleæ of the innermost row, the chætae of which alternate in position with those of the middle row, are directed inwards and upwards. Mr. Watson has found that there are two "nests" for the formation of the chætae, an outer one supplying the outer paleæ and an inner one producing the middle and inner paleæ, which are packed alternately in the nest. The chætae can be traced, and evidently travel, in a somewhat spiral fashion to reach, in rotation, their respective positions at the dorsal end of each opercular crescent. A similar process was observed in *Sabellaria spinulosa*, but in this species there are, in each lobe, two or three long, curved, acicular dorsal chætae in addition to the three rows of chætae which form the operculum. In certain members of the family, *e.g.* Pallasia, the operculum is armed with only two rows of paleæ, but there exist, in addition, two or more hooks, placed dorsally, in positions corresponding to the acicula above mentioned. These hooks have been regarded by some zoologists as homologous with the missing middle row of opercular paleæ, but this view is rendered very doubtful by the conditions found, and described above, in *Sabellaria spinulosa*.

The Anatomy and Physiology of Calma glaucoides.

Calma is a small nudibranch mollusc living exclusively on the eggs of fishes, which it simulates closely in appearance. Mr. T. J. Evans described the modifications which this animal has undergone in response to its specialised diet. The radula, a rasping instrument in other gastropods, has become a saw for cutting open the eggs, the teeth being reduced to a single row. The stomach is enormously enlarged, and in well-fed specimens is filled with a hard, albuminous mass. During the feeding period the growth of the genital organs is retarded; they do not develop until the contents of the stomach have been digested, by which time space is available for the growing gonads. The gonads are not massed as in an ordinary Eolid, but are packed in the angles between the liver diverticula, and the male duct has been pushed forward to the level of the mouth. There is no intestine or anus, and the excreta of the first year remain on the floor of the stomach and liver branches under the food of the second year. In the cerata certain amœboid cells of the hæmocœl enter into relations with the liver cells and absorb protein from them. When fully impregnated with nutritive material they fall back into the hæmocœl as oval glassy cells, and the protein contents are gradually absorbed during the winter fast.

Sex and Immunity.

Mr. Geoffrey Smith gave the results of further work on the effects of the parasitic cirripede Sacculina on the spider crab Inachus. He has previously shown that the effect of the parasite is to cause the male host to assume adult female characters externally, and, after the death of the parasite, internally also, for large ova were produced in the testes. The effect of the parasite on the young female crab is of a similar nature, for the young infected female is forced to assume adult female characters at a premature stage. Mr. Smith suggested an ingenious explanation of these phenomena. He showed that, in an infected Inachus of either sex, the Sacculina-roots manufacture yolk similar to the ovarian yolk of a normal female Inachus. The parasite thus forces the crab, whether male or female, to produce substances in the blood from which the Sacculina-roots can manufacture yolk; as fast as these substances are produced the Sacculina takes them up and, by anchoring them, stimulates their continued production. These yolk-forming substances, saturating the body fluids of infected crabs, both male and female, cause the development of the secondary sexual characters. When the parasite dies and its roots no longer assimilate the yolk-forming substances, they are taken up by the remains of the gonad (which, while the crab was parasitised, had been reduced and non-functional), which consequently proceeds to form ova. In the parallel case of Peltogaster, parasitic on Eupagurus, Mr. Potts has shown that small ova are formed in the testes of the host while the parasite is still alive, so that, in this case, the excess of yolk-forming substances is taken up by the gonad during the life of the parasite. This over-production of a substance which is being anchored by a parasite is regarded by Mr. Smith as closely analogous to the production of antibody in immunisation. By supplying the Sacculina with the yolk-forming substances, the crab protects other nutritional substances necessary for its vital organs from being abstracted by the parasite.

In answer to comments by Prof. Bateson, F.R.S., and Prof. Hartog, regarding the nature of the eggs found in the testes of male crabs recovering from the attacks of Sacculina, Mr. Smith stated that such ova are as large and as fully formed as normal eggs, become pigmented (red) like the latter, and, so far as structure is concerned, are entitled to be regarded as ordinary eggs. Replying to observations by Mr. Doncaster regarding the presence or absence of "femaleness" in the male crab, Mr. Smith said that the conditions indicated that the male contains latent female potentialities, for these latter could not be introduced by the Sacculina, and yet complete formation of morphological female characters took place in recovering males.

The Colours of Insect Larvae.

Prof. Walter Garstang described a series of experiments which he had carried out this summer on the effects of foods deficient in chlorophyll on the coloration of phytophagous larvæ of Lepidoptera. The experiments were designed to confirm and extend the results obtained in 1892 by Prof. Poulton, who showed that, in the case of *Tryphaena pronuba*, larvæ fed on the white mid-ribs of cabbage retained a white ground colour (with the addition of superficial black pigment in the later stages), while larvæ fed on yellow etiolated leaves developed the same green and brown pigments as those fed on green leaves. Prof. Garstang obtained very similar results, using the larvæ of *Euplexia lucipara*. Larvæ fed from the time of hatching on the yellow inner leaves of lettuce developed the same green pigments as those fed on green leaves, while larvæ fed on the mid-ribs acquired a semi-transparent whitish colour, very faintly tinged with green or yellow. The superficial blackish markings developed in all cases.

On the other hand, the larvæ of *Mamestra brassicae* fed on mid-rib of lettuce and on carrot, while failing to produce the normal green colours, also showed a marked

deficiency of the black superficial pigments which formed a conspicuous element in the coloration of normal green-fed larvæ during the last two stages. Several larvæ fed on mid-rib were practically white at the time of pupation; those fed on carrot were slightly darker. Further experiments would be necessary to show whether the deficiency of black pigments was due to altered metabolism or was comparable with the many cases among Geometrid and Vanessid pupæ, &c., in which the formation of black superficial pigment-screens is subject to inhibition from white or yellow backgrounds. The latter interpretation of this case was regarded by Prof. Garstang as improbable on the evidence available, for the mid-rib set had been kept for the most part in a dark cupboard, and two of these larvæ, transferred, when half grown, to purple cabbage in the light, had shown the same features to a pronounced degree.

In the discussion which followed, Mr. Doncaster inclined to the other interpretation, and suggested that the light reflected from the alimentary canal of the specimens on purple cabbage (which became blue-green after ingestion) may have had an inhibitive effect.

Insect Coloration.

Mr. Mark L. Sykes exhibited specimens of various insects among leaves and other natural objects, and in his remarks held that the colours of these insects supported the view of protective coloration. Mr. G. Storey, commenting on some remarks of Mr. Sykes on mimicry, mentioned Prof. Punnett's experiments on certain Ceylon butterflies of the genus Papilio, which are supposed to afford one of the most striking cases of mimicry. These experiments, he thought, were by no means sufficient to overthrow the theory of mimicry, but they showed that the mimickers derived little protection from their deception from certain classes of their enemies.

The Biology of Teleost and Elasmobranch Eggs.

Dr. W. J. Dakin confirmed the results reached by Botazzi and others which indicated that the osmotic pressure and salinity of the blood of marine teleosts were different from that of the external medium in which they lived, but were affected by changes in the salinity of the water. The blood of the eel has a lower osmotic pressure in fresh water than in the sea, and the blood of fresh-water fishes is less saline than that of marine fishes.

The osmotic pressure of the blood of elasmobranchs is almost identical with that of the sea water in which they live.

Dr. Dakin extended his observations to the eggs of certain fishes, and showed that the specific gravity of plaice eggs can be altered by varying the salinity of the water in which they are living. The egg-contents are therefore not independent of the sea water. He also showed that the salinity and osmotic pressure of the egg-contents was much less than that of the medium in which the eggs were living, and about the same as that of the blood of the adult fish. There is therefore an equilibrium between the sea water and the egg-contents which does not consist in an equality of osmotic pressures; while both osmotic pressures are very different, a change in that of the water produces a small but definite change in that of the egg-contents. Death of the egg-contents destroys the conditions under which this equilibrium is sustained, and the egg-contents increase in salinity by reason of the influence of the surrounding sea water; a corresponding increase in specific gravity takes place, and the egg is no longer able to float.

The osmotic pressure of elasmobranch eggs is very different from that of teleost eggs, though both may be living in water of the same salinity. The relation existing between the egg-contents of dog-fish eggs and the water is the same as that between the blood of the adult fish and the medium in which they live.

Semination in the Sanderling.

Prof. C. J. Patten has already pointed out that examples of the sanderling (*Calidris arenaria*), apparently in nuptial plumage, and occurring along our shores at the height of the breeding season, are not fully matured, their plumage presenting a slight difference from the true nuptial garb. To this plumage the name pre-nuptial was applied. Prof. Patten found, on examining the testes of such birds, that although a certain amount of spermatogenesis had taken place, no real functional activity had been reached. Of the sanderlings which occur on our coasts during the period when they ought to be nesting, those birds not pairing seem to divide into small parties and to lead a sort of nomadic life from shore to shore until about the end of August, when they tend to muster; in September they join company with migrants coming from northern climes, the latter, as a rule, being young birds in first autumn plumage. There are thus formed flocks of young and partially matured birds. The fully adult birds arrive about October. Prof. Patten considers that there is reason to believe that other species of shore-birds take more than a year to reach maturity, and that, prior to this period, their desultory migratory movements correspond in the main with those of the sanderling. Investigations into the question of semination in these cases would afford elucidation of some points of importance regarding avian migration and geographical distribution.

Anatomical Adaptations in Seals to Aquatic Life.

Dr. H. W. Marett Tims exhibited a series of lantern-slides illustrating some of his observations on the collection of embryo seals obtained by the *Discovery* expedition, and directed attention to the adaptations to aquatic life which these animals present. The rotation of the limbs to the adult position takes place at an early stage of development. The shortening of the neck is produced by a great ventral curvature of the spine in the cervical and anterior dorsal regions. This, too, is indicated at a very early embryonic stage in both male and female. Dr. Tims remarked, incidentally, that the manner in which the cervical region of the skeletons of seals in our museums was set up, namely, with the vertebræ almost in a straight line, was quite wrong. The prevention of the entrance of water into the lungs is brought about by a secondary growth of the posterior edge of the soft palate, which becomes fused with the wall of the œsophagus. The fact of the very early establishment of these modifications affords an instance of what some would regard as examples of the inheritance of acquired characters.

The Temporal Bone in Primates.

Prof. R. J. Anderson contributed some notes on the temporal bone in primates, pointing out that the squamosal shell, which has three or four ossific centres, sometimes shows a separate zygomatic part and occasionally a separate upper triangular part. The antero-posterior and vertical measurements of the bone in several primates were given; they vary from 5 : 1 in Pithecia to less than 2 : 1 in Semnopithecus. The various antero-posterior dimensions were regarded as evidence of facial influence and the vertical ones of cranial influence.

The Oxford Anthropometrical Laboratory.

Dr. E. Schuster presented some first results from the Oxford Anthropometrical Laboratory. One of the most interesting tests there carried out was that devised to measure the power of concentration. A pattern, made by pricking nine holes in a piece of cardboard, was shown to the subject five times, on each occasion for only a small fraction of a second. The subject was then asked to make a map of it on squared paper, which he generally failed to do correctly; he was shown the pattern again five times, and asked to make a fresh map, and so on until he produced a correct one. It was found that those men acquitted themselves best under this test who subsequently did well in the final schools, and that men reading science and mathematics were, on the whole, better than those reading other subjects.

The Relation of Regeneration and Developmental Processes.

After dealing with a large number of examples illustrating this subject, Dr. J. W. Jenkinson pointed out that, in development, three processes are clearly recognisable—cell and nuclear division, growth, differentiation. Differ-

entiation—the main problem—is determined by external factors, such as the physical and chemical environment, and by internal factors, *e.g.* the initial structure of the germ and the interaction of developing parts. Experiments prove that there exist in the cytoplasm definite organ-forming substances arranged in a definite manner, and sometimes stratified and graded. Such an arrangement accounts for the observed progressive restriction of the potentialities of parts. During cleavage these substances are segregated into cells, but the order in which this takes place seems to be immaterial; the essence of segmentation is the reduction of the ratio of cytoplasm to nucleus.

In regeneration—the production of a whole structure by a part in a differentiated organism—similar processes and factors may be observed. The regenerate often differs quantitatively or qualitatively (heteromorphosis) from the original; reversal of polarity is a special case of the latter. Features common to all regeneration are:—(1) the covering of the wound; (2) cell multiplication (resulting in the reduction of the cytoplasm-nucleus ratio); (3) growth, always at right angles to the cut surface, and at a rate which alters like the ontogenetic rate; (4) differentiation, which usually follows the ontogenetic order, but may differ from it (anomalous behaviour of germ layers). Of the external factors concerned little is known except that the actual injury is the prime stimulus; the internal factors are:—(1) interaction of parts; (2) size (there is a minimal size); (3) degree of differentiation (power of regeneration decreases with age); (4) level or material (necessarily cytoplasmic, since the nuclei are all alike); (5) polarity, which may be expressed in terms of a graded stratification of materials. The adult organism contains the same organ-forming substances as were present in the germ, and arranged in a similar way; the difficulty is that the former is divided into cells. A further difficulty is presented by the anomalous behaviour of the germ layers and by the fact that a part, in which these substances exist, *ex hypothesi*, in other than the correct proportions, can yet form a whole. This indicates that the problem is fundamentally one of assimilation; and Dr. Jenkinson pointed out, in conclusion, that metabolism and regeneration in the protozoa are solely dependent on the presence of the nucleus.

Prof. C. S. Minot gave an address, which, however, cannot be summarised in a few lines and without the aid of diagrams, dealing with the relations of the primitive streak, blastopore, neurenteric canal, and medullary folds in various vertebrates.

Cytological papers by Prof. Hartog and Dr. Edwin Hindle were contributed to the joint meeting of Sections D and K, and Dr. E. J. Russell read, to the joint meeting of Section D and Sub-section B, a paper on the part played by micro-organisms, other than bacteria, in determining soil fertility. A notice of these papers will be found in the reports of the proceedings of Section K and of Sub-section B.

J. H. ASHWORTH.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

IN his presidential address on some of the more pressing needs of geography, Prof. A. J. Herbertson spoke of geographical classification and terminology especially with regard to the genetic classification of land forms, and gave suggestions as to a suitable form of notation. In speaking of geographical units, he laid great stress on the significance of vegetation to the geographer, for which a study of climatic regions is as necessary as a study of morphological ones. Dr. Herbertson's address was printed in full in NATURE of September 22.

The first paper was by Dr. J. D. Falconer, on the origin of some of the more characteristic features of the topography of northern Nigeria. The rivers belong to two great hydrographical systems, the Niger-Benue and the Chad systems. The watersheds are lofty plains of a mature topography, while the prominent hills exert only a secondary influence on the drainage system. In their upper and middle courses the rivers flow over open plains the surface of which is diversified by numerous isolated granite domes, turtlebacks, and inselberge. In their lower courses they often flow in deep valleys bounded on either side by ranges of flat-topped hills. These hills have been carved out of horizontal sedimentary rocks, while the isolated domes of the upper plains are clear evidence of a crystalline floor. The peculiar character of the river valleys is entirely due to the recent origin of the whole river system.

Two papers were read by Dr. W. S. Bruce, the first on Prince Charles Foreland, Spitsbergen, the second on his plans for a second Scottish National Antarctic Expedition. During the summers of 1906, 1907, and 1909, Prince Charles Foreland was explored by Scottish expeditions under Dr. Bruce's leadership. The expedition of last year in the steam-trawler *Conqueror* was on the most extensive scale of the three, and practically completed the exploration of the island. The chief object of the work was to make a detailed map of the Foreland on a scale of two miles to the inch. This map is a continuation of similar work carried on by the Prince of Monaco on the mainland, and by Norwegians under his direction. The island is about fifty-four miles long and from three to seven and a half miles broad, with an area of 262 square miles. An almost continuous range of hills, the northern Grampians, occupies the northern two-thirds of the island, and rises to 3800 feet in Mount Monaco and 3300 in Mount Jessie. Separating these from the Ross heights at the southern end is an extensive low-lying part, called the Foreland Laichs, apparently a raised sea bottom. On the east an almost continuous ice-sheet flows from the northern Grampians to Foul Sound, but the west is free from glaciers. A bathymetrical survey of Foul Sound demonstrated a bar towards the northern end over which vessels drawing more than 12 or 15 feet have difficulty in finding a passage. The rocks are mainly Hekla Hook schists and graywackès, with a small pocket of tertiary beds on the east near Ferrier Haven. The completed topographical map will be one of the most detailed ever made of any part of the polar regions.

The plans for a second Scottish National Antarctic Expedition were first published in 1908, but have since been matured and elaborated. It is intended first of all to complete the bathymetrical survey of the South Atlantic between Buenos Aires and Cape Town, and Cape Town and the South Sandwich group. A course will then be set for Coats Land, discovered by Dr. Bruce in 1904. Wherever a suitable landing-place can be found along this coast, the base of the expedition will be established. From this base Dr. Bruce will endeavour in the following summer to cross Antarctica *viâ* the Pole to Victoria Land, a long journey, but one which for the greater part of the way will be over entirely new ground, and must result in considerable light being thrown on the complex and difficult problem of the structure of Antarctica. After landing Dr. Bruce and his party on Coats Land the ship will continue eastward, conducting oceanographical work along the edge of Antarctica. On this work Dr. Bruce lays particular stress. It is also hoped to map in the "missing" coast line between Coats Land and Kaiser Wilhelm Land. After refitting at Melbourne, the ship will proceed southward to pick up Dr. Bruce at some point on Victoria Land, and then make for New Zealand. Thence *viâ* Cape Horn a course will be made for Coats Land to embark the remainder of the party left there, who will have been conducting meteorological work during two winters and one summer. From Coats Land the expedition will return home. The exploratory work will be conducted entirely in the Weddell and Biscoe quadrants, for Dr. Bruce recognises that the Ross sea and adjacent lands are the special province of Captain R. F. Scott and Sir Ernest Shackleton. The total cost of the expedition will be about 50,000*l.*

In the afternoon Captain J. K. Davis, of Sir Ernest Shackleton's recent expedition, read a paper on the voyage of the *Nimrod* from Sydney to Monte Video. Attempts were made to locate certain doubtful islands, viz., Royal Company Islands, Emerald Island, the Nimrod group, and Dougherty Island. None of these islands were found, and deep soundings were obtained on or near their supposed positions. They may therefore be removed from the chart. A visit to Macquarie Island resulted in some interesting collections. The two-hourly meteorological observations taken during this voyage, which extended through May and June, should prove of great importance.

Friday morning was devoted to a joint meeting with Section C. Three of the papers dealt with local geo-

graphy. Mr. C. Johns gave an account of the geology of the Sheffield district. He was followed by Prof. A. McWilliam, who read a paper on the metallurgical industries in relation to the rocks of the district. Sheffield is a striking example of a town that has arisen in response to local geographical controls. In past times the thick woods of the district supplied the principal metallurgical fuel, charcoal. The clay ironstone yields excellent pig-iron suitable for castings and the best qualities of wrought iron. The bulk of the ironstone now used, however, is brown iron-ore, hydrated ferric-oxide, from Northampton, Leicester, and Lincoln, though for the best steels the hematite ores of Lancashire, Cumberland, and Spain are imported, and Swedish wrought irons are used for cutlery and edge tools. The district is one of the richest in the kingdom in regard to coal supply. Different beds are found suitable for making coke for crucible, cupola, and blast furnaces, and even one that fulfils the very exacting needs of the cementation furnace. The sandstones of the coal measures, often containing 98 per cent. of SiO_2, yield excellent ganister. Fireclay is abundant and of exceedingly good quality. The sandstones of the coal measures, not millstone grit, are now principally employed for grindstones. The carboniferous limestone is available as a flux, while fluorspar, easily obtainable in the great heaps of gangue left by the lead miners of Derbyshire, is used to help in desulphurising steel. Lastly, a soft Upper Permian sandstone makes an ideal moulding sand, since, from the nature of the component grains, it exactly strikes a compromise between binding properties on the one hand and porosity on the other. Speaking after this paper, Prof. Kendall directed attention to the importance to Sheffield of the unoxidised iron ores of Leicestershire and Lincolnshire, which are almost identical with the Cleveland iron ore. When the oxidised ores of Northamptonshire and Lincolnshire are exhausted in about thirty years' time, these will be of great value to Sheffield. Prof. Herbertson insisted on the importance of improving the Trent as a waterway in connection with the eastward extension of the coal-field.

The Humber during the human period was the subject of a communication by Mr. T. Sheppard. With the help of a series of maps, he showed the changes that have occurred in the Humber and on the coast of Holderness from the time of Henry VIII. until the present day. The rapid destruction of the coast at the rate of several feet a year is, in a sense, compensated for by the silting up of the Humber and the growth of new land. Hull is slowly but steadily moving southward to maintain its position as a deep-water port.

Dr. Tempest Anderson gave a description of Matavanu, a new volcano which broke out in Savaii in the Samoa Islands in 1905. Other papers read before the joint meeting of Section E and C were, on the present Triassic conditions in Australia, by Mr. E. C. Spicer, and one by Dr. W. H. Hobbs on some considerations concerning the alimentation and the losses of existing Continental glaciers.

In the afternoon Dr. Hamilton Rice gave a lecture on his journey across South America from Bogotà to Manáos, the object of which was to discover the sources of the Uaupés River. The route from Bogotà was to Villavicencio, and thence over the Andes to San Martin and the densely forested area of the Amazon basin. He described the aborigines inhabiting the banks of the Uaupés, among whom he found both Caucasian and Mongoloid types.

On Monday, September 5, the first paper was by Mr. J. Howard Reed on the geography of British cotton-growing. A shortage in the supply of raw cotton threatens seriously to affect Lancashire. The quantity of cotton used to-day in Lancashire is only a trifle more than was the case twenty years ago, but the amount used on the Continent has nearly doubled, and the total is now more than twice that of the British figure. The American mills now consume an amount nearly equal to the whole of the continental demand and about double the British demand. Mr. Howard Reed foresees a serious crisis for the Lancashire mills unless supplies of raw cotton can be obtained from other than American fields. It is only by fostering and developing cotton-growing in British colonies that, he believes, the English cotton industry can be saved from virtual extinction. Hence the efforts of the British Cotton-growing Association. Considerable success has attended the efforts of the association in the British West Indies, but the greatest results are expected from Uganda, Nyasaland, and Nigeria. The increased production of cotton, due to the efforts of the association, has been progressive from year to year, but the needs are so enormous and the work so colossal that the increased supplies obtained during seven years only reach about one-thirtieth of Lancashire's average yearly demand. Mr. Reed said that a sum of five millions might well be employed in the development of cotton-growing, and the African colonies he looked upon as an incomparable field. Mr. G. G. Chisholm, in making some remarks on this paper, declined to take anything like so pessimistic a view with regard to the future of our cotton industry, nor, on the other hand, was he so hopeful with regard to the effect on Lancashire of the remedies suggested.

Major R. G. T. Bright followed with a paper on the Uganda-Congo boundary survey, in which he described the country on the western frontier of the Uganda protectorate. Captain E. M. Jack communicated a report on the survey of the 30th meridian arc, Uganda protectorate, 1908–9.

Lieutenant P. T. Etherton, Indian Army, gave an account of a journey from India through Gilgit, Hanza, across the Pamirs, and thence by Chinese Turkestan, Mongolia, and Siberia to the Trans-Siberian railway. Lieutenant Etherton left Lansdowne in the Himalayas in March, 1909, and reached the Siberian railway in February, 1910. From the Pamirs the route was by the Ili Su Pass (16,750 feet) to the Yarkand River, and thence to the Kulan Urgu valley by a previously unexplored pass at 17,400 feet. Three months were spent in the Tian Shan mountains, during which time the little-known Great Yulduz valley was traversed. Thence the expedition passed by the Ili valley to the town of Kulja. From here Lieutenant Etherton struck through the Sairam Nor and Ebi Nor country to Chuguchak, and reached the foot of the Altai mountains on the northern side of the Black Irtish valley in the depths of winter. After considerable difficulty the expedition reached Zaisan, a small town on the Siberian-Mongolian frontier, early in January this year. Big game shooting was the chief object of the journey.

On Tuesday, September 6, the first paper was by Mr. William Wilson, on a new globe-map of the world. The author emphasises the importance of the globe in geographical teaching, and he overcomes the drawbacks of its high price and cumbrous nature by mounting a special globe map on thin cardboard and cutting out the gores. The two ends of the map are joined to form a cylinder by a clip at the equator; a spindle is introduced, and the tips of the gores are passed down over the ends of the spindle by means of holes punched at the ends of each gore where the poles would be. A metal clip at each end holds the tips in position, and serves as a convenient means of handling the globe. The apparatus can be made up or dismantled in a few minutes, and can be studied flat or as a globe. The world from equator to pole is divided into three belts of 30° each, which form the primary divisions of latitude. The longitudes are divided primarily into eight groups of 45° each, a group forming a gore. By these primary divisions the world is divided into forty-eight sections. The sections can be enlarged to any extent, forming an atlas on a simple equal scale that is readily grasped. A set of "window" diagrams, each one combining a section of one belt on this plan and the same area as shown on Mercator, makes an instructive demonstration of the exaggeration necessary to Mercator.

Two papers followed dealing with regional surveys of selected areas of the British Isles on the lines indicated some years ago by Dr. H. R. Mill. Mr. James Cossar dealt with the Midlothian district. After pointing out the configuration of the area, Mr. Cossar dwelt on its geology so far as it affects the place relations, local conditions, or economic development. Thus the volcanic action of the past gave rise to hills and ridges in the western part of the region, which have in cases offered sites for fortifications, as Edinburgh Castle and Inchkeith, and have materially affected the lines of communication. The export of road metal and the physical conditions at Queensferry, which favoured the construction of the Forth Bridge, both entail a discussion of geological facts. The importance of the glacial period was considered, firstly in its influence on the physical structure, secondly on the drainage system, and thirdly on the economic resources. In this connection

Mr. Cossar examined and described a remarkable series of dry valleys which have resulted from glacial action. The history of the rivers and their present economic value were discussed, and then successively Mr. Cossar examined the climate, vegetation, mineral resources, industries, occupations, and distribution of the population.

Mr. O. G. S. Crawford's regional survey was of the Andover district, which he discussed under the successive headings of physical features, natural vegetation, industries, including agriculture, settlements, and communications, concluding with a survey of the reaction of man upon his natural surroundings.

Mr. H. Brodrick read a paper on the underground waters of the Castleton district of Derbyshire. To the west of Castleton is a long valley, in the base of which runs one of the transverse Pennine faults which brings down the carboniferous limestone, so that the streams to the north run over the Yoredale beds to sink into the limestone. Of the several streams, only one ends in a cave of any size, the Giant's Hole. It was this stream principally that Mr. Brodrick explored.

Dr. C. A. Hill read a paper on the further exploration of the Mitchelstown caves in Ireland, carried out by himself and Mr. Brodrick. At the Dublin meeting in 1908 the author gave an account of these caves, but since that date an exhaustive survey of both caves has been carried out.

Several papers of geographical interest were contributed to other sections, but special attention must be directed to the discussion, opened by Prof. P. F. Kendall in Section C, on the concealed coalfield of Nottingham. In the course of his remarks Mr. Kendall announced that the coal measures had been reached at Scunthorpe, eleven miles east of Thorne. Borings are also in course of progress at Thorne, Snaith, Selby, and Newark. This coalfield, he considered, would be the hope and support of industrial England in the future.

ENGINEERING AT THE BRITISH ASSOCIATION.

THE first meeting of the engineering section was held on Thursday, September 1, when, in addition to the president's address, only one paper was taken—the testing of lathe tool steels, by Prof. Ripper. Two methods of testing lathe tools are commonly employed; in one, the object of the test is to ascertain the length of time the tool will run under given conditions before it has to be reground; in the second, the object is to ascertain the actual cutting speed which would entirely destroy the tool in twenty minutes. Prof. Ripper was of opinion that both these methods were of doubtful utility, the latter because, in order to determine the standard speed, so many tests had to be made. He had, therefore, devised another method, which he called the speed-increment test. In this method the tool was started at a standard cut—at a surface speed of, say, 30 feet per minute—and the speed of cutting was then gradually increased by equal increments of 1 foot per minute until the tool broke down. Prof. Ripper showed a number of curves to illustrate the results obtained by this method of testing, and, after the reading of the paper, he gave a demonstration in the University laboratory. The variation of the speed was obtained by means of an electrical drive.

The first business of the section on Friday, September 2, was the discussion on the third report of the committee on gaseous explosions. The chief experimental work undertaken by the members of the committee had been the determination of the amount of radiation from flames. Prof. Callendar had experimented on the radiation from open flames in the laboratory, and Prof. Hopkinson on radiation from gases in a closed combustion chamber. These experiments showed that a flame was, to a certain extent, transparent to the same radiation that it emitted, Prof. Callendar finding that two similar flames placed one behind the other radiated nearly twice as much as a single flame. Before the discussion opened, Prof. Dixon described the experiments he had recently carried out on the ignition of gases by adiabatic compression. The gases were rapidly compressed in closed glass tubes, and a continuous photograph was taken by means of rapidly moving films. Prof. Dixon pointed out that it had been anticipated that such gases would be uniformly heated, and that they would, therefore, ignite simultaneously at all points; he did not, however, find this to be the case—the explosion was never sharp nor violent; the ignition invariably began at one point, and then spread throughout the tube. The discussion largely turned on the question of the part played by radiation in regard to the missing quantity in gas-engine heat balances. Captain Sankey pointed out that the modern gas engine had an efficiency of 80 per cent. to 90 per cent. when compared with the standard theoretical gas engine, and that there was thus only a loss of some 10 per cent. to 20 per cent., there being, therefore, not much scope for further improvement.

The remaining business for the day was the reading by Prof. Ripper of a paper on a new method of testing the cutting quality of files. Until the invention of the Herbert file-testing machine a few years ago, the only method of testing the cutting power of files had been the hand tests carried out by expert workmen. From some experiments he had been asked to carry out, the author was of opinion that the results obtained in the Herbert file-testing machine were not normal, and he considered that this machine had a serious defect; owing to the fact that the file moved across the face of the test bar through an absolutely constant path, the teeth of the file, each stroke, worked in identically the same grooves or furrows on the face of the test bar, the result was that the surface of the test bar became occasionally, as it were, glazed, and the file ceased to cut properly. With the view of overcoming this defect, Prof. Ripper designed an addition to the Herbert machine with the object of making the path of the file no longer a constant one. To secure this result the file was no longer held rigidly at each end, but was connected by ball joints, the effect of which was equivalent to the wrist movement at each end of the file during ordinary hand-filing. The eccentric motion at one end of the file was obtained by a worm gearing actuated by the reciprocation of the machine. The author found that with this addition the Herbert file-testing machine gave extremely concordant results, and a number of curves were shown to illustrate this point. After the conclusion of the day's proceedings a demonstration of the machine was given in the engineering laboratory.

The section opened its proceedings on Monday with a paper by Mr. P. Dawson on the electrification of the London, Brighton and South Coast Railway between Victoria and London Bridge. The author had been responsible for the design of this important work. Bearing in mind the possibility of future developments, he had decided to adopt single-phase electric traction at 6700 volts, with a periodicity of 25. The motors would develop 115 horse-power for one hour, with a rise of temperature of only 70°, and 60 horse-power for twelve hours continuously under the same conditions; there were four motors to each car. Great trouble was experienced in overcoming the difficulties due to the low head room at certain of the overhead bridges; thus while the normal height of the overhead wires was 21 feet 6 inches above rail-level, there was only available a height of 13 feet 9 inches at some of the bridges, and the collector bow had to be adapted to this extreme variation in height. So far the installation had proved entirely satisfactory.

This paper was followed by one by Mr. H. E. Wimperis on the use of an accelerometer in the measurement of road resistance and horse-power. The accelerometer designed by the author consists of a brass box, which contains a copper disc mounted on a vertical pivot, with its motions damped by a permanent magnet. The centre of gravity of the disc is not in the axis, hence, when the box moves forward, one side of the disc tends to lag behind, and thus to wind up partially a coiled spring, and so actuate a pointer moving over a scale. An ingenious gearing prevents the reading from being affected by any accelerations at right angles to the direction of motion. By the use of this instrument road resistances can be read off at sight, and the brake and indicated horse-power of the engine can be obtained for various speeds.

Prof. Coker next described his experiments on the cyclical changes of temperature in a gas-engine cylinder near the walls; it was found that the highest temperature

near the walls could be measured by couples made from 10 per cent. alloys of iridium and rhodium with platinum; the author estimated that the maximum temperature at the place of measurement was between 1850° and 1900° C.

The business of the day concluded with a discussion on the principles of mechanical flight, opened by Prof. Bryan. As a matter of fact, owing to the line of argument adopted by the opener, there was practically no discussion on principles, but there was a somewhat heated debate as to the respective provinces of the mathematician, the physicist, and the engineer in solving the problems of mechanical flight. If the engineer is to wait until the mathematician has evolved a completely satisfactory theory as to the stability, &c., of aëroplanes, it is quite clear that little further progress will be made. The successful developments of most of the mechanical devices now employed by man have followed lines very different from those which seem good to Prof. Bryan; and mathematical theory has generally followed, and not preceded, the engineer's victory over the forces of nature.

The proceedings were opened on Tuesday, September 6, by a paper by Prof. Coker on the optical determination of stress. Prof. Coker has been working for some time at this problem, utilising the well-known fact that glass is rendered doubly refractive by stress; as glass, however, owing to the difficulty of obtaining suitable pieces free from initial strains, has proved unsuitable, the author has fallen back on the use of xylonite, which answers admirably. The apparatus necessary included an arc lamp to supply the beam of light, and lenses and prisms. The author showed a number of lantern-slides of the permanent records he had obtained by making use of Lumière colour plates.

Prof. Dalby then read his paper on the measurement of the air supply to a gas-engine cylinder; the air on its way to the engine flows through an orifice into a chamber, from which it passes to the suction valve; the engine is fitted with an apparatus which enables the temperature corresponding to the pressure and volume at an assigned crank angle to be measured, and thus all the data required for calculating the weight of air passing through the orifice per second are accurately known.

Prof. S. P. Thompson next read a paper on the laws of electromechanics; the author stated that his object was to put into concrete form the chief laws governing the performance of various electromagnetic mechanisms, and a number of formulæ was deduced.

Mr. F. Bacon then read his paper on heat insulation, in which he described his researches into the heat-insulating efficiency of a number of materials; the heat which was transmitted was produced electrically, and electrical methods were employed to measure the temperatures. In the discussion it was pointed out that in lagging steam-pipes there was with each material a definite thickness which it was uneconomical to increase, as the increase of external surface increased the radiation at a greater rate than the increased thickness diminished it.

The last paper of the day was by Prof. E. Wilson and Mr. W. H. Wilson on a new method of producing high-tension electrical discharges. In this method energy is taken from an alternating or continuous current source, and is stored in a magnetic field by inductance; it is then allowed to surge into a condenser, which together with the inductance forms a low-frequency oscillatory circuit. When the energy has accumulated in the condenser, the condenser is mechanically bridged across the primary winding of an induction coil, with which it forms a high-frequency oscillatory circuit. The energy is then transmitted by the secondary winding of the induction coil to the work circuit, and may be either oscillatory or unidirectional. The apparatus is suitable for radio-telegraphy or any work employing high-tension electricity.

The concluding meeting of the section was held on Wednesday, September 7, when the first paper was one by Mr. R. W. Weekes on self-raising rollers for maps and plans, descriptive of an ingenious arrangement for mounting plans, maps, and diagrams.

The next paper was entitled "Machine for Testing Rubber by Means of its Mechanical Hysteresis," by Prof. Schwartz. The author had designed a machine in which a specimen of rubber of standard dimensions was loaded at a given rate to a given percentage of the maximum load. The load was then gradually removed, and a complete stress-strain diagram automatically taken; as rubber possesses very considerable mechanical hysteresis, the stress diagram was of a loop form; from this the chief physical characteristics of the sample could be readily deduced.

Prof. Fessenden then gave his paper on the utilisation of solar radiation, wind power, and other intermittent natural sources of energy. The author estimated that the total first cost of the solar plant per horse-power would be about 20*l*., and the annual charge about 30*s*. per horse-power; he stated that a plant of 3000 horse-power was at present in course of erection. In the discussion Sir William White expressed the view that in all these schemes for the working of intermittent sources of energy the cost of works of construction generally proved prohibitive.

The last paper was by Mr. Cook on an experimental investigation of the strength of thick cylinders. The author described his investigations into the strength of cast-iron and mild steel thick cylinders when subjected to gradually increasing internal pressure up to the bursting point. Mr. Cook had found in the case of the mild steel cylinder that the tensile stress at the yield point, as calculated by Lamé's equation, agreed closely with the value of the tensile stress at the yield point in an ordinary tension test of the steel.

The proceedings closed with votes of thanks to the president and secretaries of the section.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BRISTOL.—The first congregation for the presentation of degrees in the University of Bristol was held on October 20 before a crowded assembly. Owing to failing health, the Chancellor, Mr. H. O. Wills, was not present, and his place was filled by the Vice-Chancellor, Sir Isambard Owen. The degree list was a long one, as besides the ordinary graduating students there were fifty-two old students of University College and the Merchant Venturers' Technical College, who, having taken degrees in other universities, were admitted to *ad eundem* degrees in the University. In a few special cases, also, degrees of Bachelor were awarded to associates of these institutions. Only one honorary degree was conferred, and that, the Doctorate of Science, on Prof. Conwy Lloyd Morgan, F.R.S., lately Vice-Chancellor of the University and sometime principal of University College, Bristol. He was introduced by Prof. F. R. Barrell, dean of the science faculty, who in the course of his address said:—"Expert in knowledge of the fossil past, expert in knowledge of the living present, he stands renowned in varied fields of thought; keenly has he observed, acutely has he analysed the workings of the mind in man and bird and beast; at his behest the artless infant and the unfeathered chick alike disclose the secrets of their nascent reason; psychology, zoology, geology, all acknowledge in him a master. A teacher of teachers, he has o'erstepped the boundaries of this isle; in southern Africa he has dwelt and taught; not once or twice alone has he been called across Atlantic seas to inform the wisdom of the West. With fertile pen and with lucid speech he has made clear the subtle mazes of philosophy; his written word is read where'er the English language penetrates, and done into the German tongue it guides the Teuton in the study of nature."

CAMBRIDGE.—Mr. A. E. Shipley, F.R.S., fellow and tutor of Christ's College, has been elected master of the college in succession to the late Dr. John Peile.

Dr. Tempest Anderson will deliver a lecture in the Sedgwick Museum on "Matavanu, a New Volcano in Savaii, German Samoa," illustrated with lantern photographs, on Saturday, November 5, at 5 p.m.

The Henry Sidgwick memorial lecture, to be given by Sir George Darwin, K.C.B., F.R.S., on "William and Caroline Herschel," will take place in the hall of Newnham College at 5 p.m. on Saturday, December 3, instead of November 12, as previously announced.

IT is stated in *Science* that the Tuskegee Institute will receive about 80,000*l*. from the estate of Mrs. Dotger, and

the Hampden Institute will receive about 50,000*l.* from the estate of Miss Alice Byington. By the death of Mrs. Loomis, the estate of the late Colonel John Mason Loomis, amounting to more than 200,000*l.*, will, it is said, go to the establishment of a technical school at Windsor, Conn.

THE College of the City of New York has acquired, says *Science*, the complete private library of the late Prof. Simon Newcomb, consisting of about 4000 volumes and 7000 pamphlets dealing with astronomy, mathematics, and physics. Both pamphlets and books are being catalogued, and are now accessible to research students, in accordance with the expressed desire of Prof. and Mrs. Newcomb.

ON October 22 Mr. T. Fenwick Harrison laid the foundation-stone of new engineering laboratories for the University of Liverpool. The cost of the building will be met by a gift of 35,000*l.* received from Mr. Fenwick Harrison, Mr. J. W. Hughes, and Mr. Heath Harrison. Prof. Watkinson thanked Mr. Harrison for laying the foundation-stone, and in the course of his remarks said it is intended to make special provision for teaching and research work in connection with all branches of engineering, internal-combustion engines, steam turbine engines, refrigeration, and fuel testing, and in this respect the laboratories will be second to none in the kingdom. The donors intend that the subject of heat engines, and particularly of internal-combustion engines, shall be developed on a much more important scale than has been hitherto attempted. As shipowners who use three hundred thousand tons of coal a year they see the advantages to be derived from the successful application of the internal-combustion engine, so far as ships are concerned, for it means the reduction of coal consumption to one-half, and possibly to one-third, of that now required for steam engines. It is humiliating, said Prof. Watkinson, that the names associated with the invention of internal-combustion engines are almost without exception German, and nearly all the internal-combustion engines being built to-day in this country are being built under licence from Germany. Greater scientific knowledge is required than in the design of steam engines, and it is reasonable to conclude that the greater success of the Germans is due to their better training in scientific principles. Last year Prof. Watkinson visited all the principal schools of engineering in the United States and in Canada, and in nearly every one he found that their gigantic laboratories were being greatly extended. Both the Germans and the Americans realise far more than we do in this country the value of a university training, and they also realise that in this age, when machinery plays such a large part in almost every industry, that this training is the best for those who are to control and direct most of the great industries. That is well illustrated, said Prof. Watkinson, by the fact that there are about 17,000 students taking a four years' course in the American schools of engineering, which is about eight times the number of students taking the normal three years' course in this country.

THE introductory address at the London School of Tropical Medicine was this year delivered by Dr. Henry A. Miers, F.R.S., principal of the University of London. The subject of the address was scientific observation, and Dr. Miers directed attention to an aspect of scientific research and of training in scientific investigation which, he said, seemed in danger of escaping notice. Under present conditions scientific research is seldom pursued save by those whose object is clear and whose minds are concentrated upon a special line of investigation in which they are alive and alert to the exclusion of any distracting side-issues. Each new discovery is pursued with ever-increasing rapidity and with a system which is fruitful in results; the searchlight of investigation is turned with mechanical precision upon every new problem, and it would appear unlikely that anything of importance should be overlooked. But teachers and investigators do not sufficiently bear in mind two possible dangers that beset them under modern conditions of work. It is inherent in our senses and our intelligence, first, that those whose attention is too minutely fixed upon one thing will fail to perceive other things which are equally discernible and equally important; and, secondly, that those who look or listen too intently for a thing may actually see or hear that which they desire, even though it be not there. Later in his address Dr. Miers gave it as his opinion that, taken as a whole, scientific men are not better general observers than other people, though some among them undoubtedly are. It has been too often assumed that scientific training has a special value as developing the general powers of observation, and that because students have been exercised in special observations they have become practised observers of things in general, whereas the reverse may be nearer the truth, and in many instances certainly is so. Some practice in all-round observation should be incorporated in the training of the specialist if we are to have our students quick to observe details that do not form part of their conscious exercises; neither should they be led to suppose that, because they have been practised in observing one thing, they are therefore good observers of everything else. To him who has eyes to see, the most trivial detail may be the germ of an important discovery. Our laboratory training gives the student his eyes, but does not always teach him to use them widely or wisely.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 10.—M. Émile Picard in the chair.—The president announced the death of M. Treub, correspondant in the section of botany, and of Ernst von Leyden, correspondant in the section of medicine and surgery.—Henri **Douvillé**: The formation of the loam of the plateaux. This loam, consisting of a very intimate mixture of clay and fine sand, is well developed in the neighbourhood of Paris and in the north of France. Two hypotheses have been put forward to explain its formation, deposition from water and transport by wind. The former hypothesis is shown to be in better accord with the observed facts; to explain the height above the sea at which these deposits are found, the floods carrying the deposits are supposed to have been caused by the sudden melting of snows, the lower portion of the valley being blocked by glacier.—Serge **Bernstein**: A generalisation of the theorems of Liouville and Picard.—F. **Robin**: The law of resistance to crushing of cylindrical bodies as a function of their dimensions. The general law of resistance to crushing as a function of the dimensions of the test-pieces is expressed geometrically by a hyperbolic paraboloid.—H. **Pélabon**: Batteries with antimony and antimony selenides. An element formed of antimony and antimony selenide, with an acid solution of antimony trichloride as the electrolyte, shows varying electromotive force under the action of light. If sulphur or tellurium is substituted for the selenium the phenomena described are not produced. The effect is strongest when the element is exposed to the yellow and red rays.—G. **Charpy** and S. **Bonnerot**: The reduction of oxide of iron by solid carbon. Ferric oxide and graphite, intimately mixed, were heated in a vacuum at temperatures up to 950° C., and the reaction studied by measuring the amount of gas evolved per hour. The speed of reaction diminished as the pressure maintained in the apparatus was reduced, and became practically zero when the pressure in the tube was of the order of 0·001 mm. of mercury. Hence it is concluded that solid carbon does not reduce oxide of iron at 950° C.—P. **Mahler** and J. **Denet**: The presence of a small quantity of carbon monoxide in the air of coal mines. The amounts found varied between 0 and 40 volumes per million, with an average of 19. The maximum amount of carbon monoxide corresponded with the minimum of methane, and the maximum methane was found in the sample containing no carbon monoxide.—Paul **Vuillemin**: A natural preventative to the oak-tree disease. The disease of the oak, caused by an Oidium, is kept in check by a Cicinnobolus, a parasite preventing the multiplication of the Oidium by conidia, and its preservation by the mycelium.—E. L. **Trouessart**: The mammalian fauna of Europe.—Ch. **Gravier**: The coral reefs of the Gulf of Aden and their madrepores.—Paul **Marchal**: Contributions to the biological study of Chermes.—Edouard **Chatton**: The exist-

ence of Dinoflagellæ, cœlomic parasites. Syndinium in the pelagic copepods.—A. **Fernbach** and E. **Vulquin**: The microbicidal power of macerations of yeast and cereals. The poison elaborated by yeast is not identical with that obtained from cereals.—A. **Briquet**: Geology of the Gallo-Belgic region.

October 17.—M. Émile Picard in the chair.—P. **Helbronner**: The complementary geodesic triangulations of the upper regions of the French Alps (eighth expedition). The work done included fixing the position of eighty-seven stations, twenty of which were above 3000 metres altitude.—A. **Jacquerod** and M. **Turpaïan**: The application of the principle of Archimides to the exact determination of gaseous densities. A bulb of about 200 c.c. in volume is suspended inside a tube of slightly larger dimensions by means of a platinum wire to the arm of a balance, a suitable counterpoise being suspended from the other arm. The suspended bulb is surrounded by the gas the density of which is being measured, the exact temperature being maintained by an external water bath. The instrument was calibrated by hydrogen and oxygen, the densities of which are exactly known. The accuracy obtainable is of the order of 1 in 10,000.—G. A. **Hemsalech**: The relative duration of the lines of the spectrum emitted by magnesium in the electric spark. The results tabulated confirm the view put forward in a previous paper, that the observation of the relative durations of the lines of the spectrum may, in certain cases, furnish useful indications in the analyses of bodies containing unknown impurities.—A. **Lafay**: The influence of a local heating on the value of the pressures supported by a body placed in a regular stream of air.—Léo **Vignon**: The influence of chemical affinity in certain adsorption phenomena.—Jean de Rufz **de Lavison**: The elective *rôle* of the root in the absorption of salts. The stem absorbs indifferently, and in the same proportion, salts which are presented to it in solution, whilst, on the contrary, the plant furnished with roots exercises a marked selective action on certain salts.—Victor **Henri**, A. **Helbronner**, and Max **de Recklinghausen**: New researches on the sterilisation of large quantities of water by the ultra-violet rays. A description of an improvement of the form of apparatus given in an earlier paper. Three-fourths of the rays emitted by the tube are now utilised. An experiment was carried on for six weeks continuously, during which 25 cubic metres of water per hour were passed through the apparatus, with an expenditure of 26 watt-hours per cubic metre of water, the exit water being sterile.—Jules **Amar**: A singularity in the working of the human machine.—A. **Knapen**: Should materials be impermeable or porous?—L. **Landouzy**, H. **Gougerot**, and H. **Salin**: Experimental bacillary serious arthritis.—Charles **Nicolle**, A. **Conor**, and E. **Conseil**: Some properties of the exanthematic virus.—Eugène Daday **de Dées**: A new phyllopod collected by the Antarctic expedition of the *Pourquoi Pas?*—Edouard **Danois**: The spermaceti organ of *Kogia breviceps*.—A. **Pécsi**: The lines of fracture of the earth's crust.—Louis **Besson**: Observations of the upper bitangent arc of the halo of 46°.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* (physico-mathematical section), part iv. for 1910, contains the following memoirs communicated to the society:—

May 28.—L. **Geiger**: Determination of earthquake foci from the times of arrival.—D. **Hilbert**: Outlines of a general theory of linear integral equations (vi.).

July 23.—O. **Mügge**: Deformations in the crystals of potassium chlorate ($KClO_3$), according to investigations by Paul Fischer.—E. **Hecke**: Non-regular prime numbers and Fermat's theorem.

DIARY OF SOCIETIES.

WEDNESDAY, NOVEMBER 2.

ENTOMOLOGICAL SOCIETY, at 8.—Experiments in 1909 and 1910 upon the Colour-relation between Lepidopterous Larvæ and Pupæ and their surroundings: Elizabeth Briggs.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Estimation of Lactose in the presence of the commonly occurring Sugars: Julian L. Baker and H. F. E. Hulton.—The Colorimetric Estimation of Hydrogen Cyanide: A. Chaston Chapman.—The Polarimetric Estimation of Milk Sugar: H. Droop Richmond.—A New Method of Estimating Phosphoric Acid: G. F. Wesley Martin.

THURSDAY, NOVEMBER 3.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: The Origin of the Hydrochloric Acid in the Gastric Tubules: Miss M. P. Fitzgerald.—(1) Trypanosome Diseases of Domestic Animals in Uganda. II. *Trypanosoma Brucei*. (Plimmer and Bradford); (2) Trypanosome Diseases of Domestic Animals in Uganda. III. *Trypanosoma vivax* (Ziemann): Colonel Sir D. Bruce, C.B., F.R.S., and others.—Further Results of the Experimental Treatment of Trypanosomiasis; being a Progress Report to a Committee of the Royal Society: H. G. Plimmer, F.R.S., Capt. W. B. Fry, and Lieut H. S. Ranken.—On the Peculiar Morphology of a Trypanosome from a case of Sleeping Sickness and the possibility of its being a new Species: Dr. J. W. Stephens and Dr. H. B. Fantham.—Note upon the Examination of the Tissues of the Central Nervous System, with Negative Results, of a case of Human Trypanosomiasis, which apparently had been cured for years by Atoxyl Injections: Dr. F. W. Mott, F.R.S.—On a remarkable Pharetronid Sponge from Christmas Island: R. Kirkpatrick.

LINNEAN SOCIETY, at 8.—Biscayan Plankton, Part XIII. The Siphonophora: H. B. Bigelow.—Plankton Fishing in Hebridean Seas: Prof. W. A. Herdman, F.R.S.

RÖNTGEN SOCIETY, at 8.15.—Presidential Address: Dr. G. H. Rodman.

CONTENTS.