

THURSDAY, JUNE 18, 1914.

STUDIES IN CANCER AND ALLIED SUBJECTS.

Studies in Cancer and Allied Subjects. Vol. i., *The Study of Experimental Cancer: a Review.* By Dr. W. H. Woglom. Pp. xi+288. Vol. ii., *Pathology.* Pp. vi+267. Vol. iii., *From the Departments of Zoology, Surgery, Clinical Pathology, and Biological Chemistry.* Pp. ix+308. Conducted under the George Crocker Special Research Fund at Columbia University. (New York: Columbia University Press. 1913.) Price 5 dollars net each volume.

BOTH the late Mr. George Crocker and his wife are reported to have died of cancer, and it may be recalled that an action was brought against Mr. Crocker for the recovery of a larger fee than had originally been agreed on for the surgical treatment of his wife. Thus, perhaps, it came about that Mr. Crocker left property to Columbia University which on partial realisation yielded somewhere about 300,000l. When he made his first donation for the investigation of cancer it was decided by those who had the matter in hand that, until a form of organisation was decided on, the money could best be expended by making grants to special workers in the departments of anatomy, zoology, surgery, pathology, and biological chemistry of Columbia University and the College of Physicians and Surgeons, New York.

Leaving vol. i., which is a monograph of xi+288 pp., by Dr. W. H. Woglom, for special reference later, the outcome has been the publication of sixty-six papers, which are collected in vols. ii. and iii. Of these papers twelve have not been published before, two are reprinted with expansion, and the rest are merely reprinted. Useful introductions are supplied to the papers by the professors in several departments (notably for zoology by Calkins, pathology by MacCallum, and bio-chemistry by Gies). In these introductions are set forth the points of view from which work has been directed. It is impossible to review the separate papers which have interest mainly for those actually engaged in similar work, who will be glad to have the papers in collected form.

Calkins and his fellow-workers have thrown their main strength in the direction of studying the phenomena of growth. He claims nothing could be more clearly demonstrated than the need for "team work," or the joint activity of pathologist, chemist, surgeon, clinician, biologist, from the results of two years' work. The underlying biological principle activating the researches on growth, and binding them into a consistent whole,

was for Calkins "the physiological balance with self-regulation perfect in normal conditions thrown out of adjustment in cancer." Experiments were done on the effect of mutilating unicellular organisms. The thyroid and thymus glands were removed from rats, in order to study any possible consequences on the growth of tumours. The effects of chemical and mechanical irritation on mammalian tissues were studied, and extracts of glands injected with a view of observing any stimulating or inhibitive effects on the growth of transplanted tumours. Except the work on *Paramecium* and *Uronychia* by Calkins himself, the experiments appear to have been conducted on too small a scale, and therefore it is not surprising they are for the most part stated to be negative or inconclusive and requiring expansion. They were admittedly conducted with a view to finding a point of attack, and it would be unfair to offer any criticism.

MacCallum's introduction is an interesting and very instructive review of present knowledge from the point of view that it is, perhaps, the poverty of our knowledge as to the factors which influence the energy of growth, and, indeed, growth in general, which is responsible for our inability to arrive at a satisfactory explanation of the development of tumours.

"The intolerance of the body for the disarrangement of its tissues is quite as wonderful as the growth of tumours and its study as illuminating." . . . "We must determine the causes of the growth of cells in general and the factors which underlie the increase in the energy of their growth as well as those which limit and hold it in check and render it practically impossible for normal tissue to continue its growth when displaced from its normal relations, or when in excess of the amount necessary for the body's needs. One side of this problem seems quite as important as the other; for in the development of an invasive tumour, we have the subversion of the ordinary laws which we assume to govern the proportions and proper relations of tissue growth."

These sentences embody points of view to which many will readily subscribe. It is unfortunate that the worker on the reactions leading to resistance to the growth of cancer and also of normal tissue (as the immunity reactions may be more correctly described), and who contributes no fewer than fourteen articles out of twenty-seven in vol. ii., had not diverted some of this industry to acquiring an accurate knowledge of the work of others so as to present their views correctly and himself avoid possible pitfalls in experimentation. His presentations of Ehrlich's atreptic or starvation theory of immunity have already called forth a vigorous protest on the part

of the latter, but the misstatements are not corrected even by so much as a foot-note in the reprint in the present volume. Equally distorted statements are made by writing:—

“Bashford in his conceptions of immunity in cancers of mice and rats, denies that there is any direct influence of the host upon the inoculated cancer cell,” and, to take only one other example, by asserting, “Bashford, Russell, and Da Fano, in describing the connective tissue and vascular scaffolding of the cancer cells, mean primarily the layer of fibrous tissue which surrounds and encapsulates the graft.” On the contrary, the mere conception of a scaffolding for the cancer cells is intended to exclude this idea. What is meant is the penetration of the connective tissue and vascular cells between the cancer cells in such a way that the original arrangement is accurately reproduced in normal animals, but not in immunised animals. It would not have been worth raising the point now had it not been that the power of the cancer cells to elicit a specific form of stroma in the normal animal, and the paralysis of their power to do so in immune animals, are as yet the only trustworthy manifestations of the regulation of growth on which MacCallum rightly lays so much stress.

The tentative character of several of the papers is necessarily the result of the system of giving grants to workers for a particular line of research for a determinate period, and can only be avoided by adopting a system enabling men with wide knowledge and training to become intimately acquainted over a long period with such highly specialised work as cancer research has now become. Thus, MacCallum writes on the basis of the work criticised above on resistance to growth, that in an immune animal the portion of tumour implanted is surrounded by connective tissue as though it were a mere foreign body; and in spite of this abundant *stroma reaction*, or perhaps on account of it, the tumour fails to grow. The important facts are not only the surrounding of a graft in these circumstances by a connective tissue which *differs* from that in normal animals, but also the failure of the reacting tissues to penetrate into the graft so as to supply it with a new characteristic stroma or scaffolding. Similarly, the occasional finding that resistance has been produced after the inoculation of tissue from a strange species, or by autolysed tissues, or that it is possible to convey passive immunity, cannot be employed against the enormous preponderance of observations to the contrary.

It would be ungenerous not to admit that mistakes are unavoidable at the outset of inquiry planned as were these preliminary investigations

of the Crocker Fund, and MacCallum himself generously acknowledges the progress being made by experiment in a brief summary. “When it became apparent that tumours of animals could be transplanted, and thus used in experimental studies, great hopes were roused, and, indeed, in the past years great things have been accomplished. When we sift the facts impartially, however, we find that we have still some of the greatest problems before us.” Of the individual papers, reference may be made to those on the cultivation of tissues, in which due credit is given to Ross Harrison for initiating the method.

Gies, in introducing the bio-chemical investigations, says he believes that “the essential factor in the etiology of cancer is a stimulus to cell division of intra-cellular origin, and that complete understanding of the disease awaits more definite determination of the constitution of protoplasm, and the reaction tendencies and functional alignments of the substance peculiar to cells.”

“Injury causes different kinds of disease because different discoordinations of intra-cellular constituents result therefrom. . . . Tumours may result from intra-cellular derangements, from discoordinations of functionally related cellular constituents. . . . More closely defined a disturbance in the production of all the anti-bodies directed against the cells or proteins of other individuals of the same species might be of prime importance as an etiological factor in cancer Iso-cells.” Unfortunately, Gies’s programme could not be carried through owing to the difficulties placed in his way. “Without tumourous animals, without cancer patients, and without carcinomatous supplies, all our plans for direct chemical attack on the cancer problem had to be suspended.” All three volumes are well indexed.

Reverting to vol. i, it is correctly described in the sub-title as a review of “The Study of Experimental Cancer,” and is a compilation by Dr. W. H. Woglom of all that has been done on experimental cancer. Incomplete reviews are available in Germany by Karl Lewin and in France by Contamin, but there existed up to the appearance of the present volume no complete or, indeed, extensive review of the more recent experimental investigation of cancer. Dr. Woglom has now supplied this want in a most admirable and complete manner. The literature of experimental cancer has grown at a great rate, and is already so enormous that only those who have been in the midst of this work from the beginning can take a comprehensive survey of the subject. To them, however, the book must prove an indispensable book of reference, but it will be even more welcome to others who wish to take up

the threads of research now or later. A critical *précis* is not attempted, because so much of the work is too new to permit of fair criticism and evaluation. The results which are likely to prove permanent are set forth in a final chapter.

The volume is written in a remarkably clear style. Contradictory results and deductions are set forth with the utmost effort at impartiality, so that the reader can readily find points of attack for fresh work should that be his object. The indices, both of subjects and of authors, are very full, and the literature given is probably as complete as it can be. It is within the knowledge of the reviewer that Dr. Woglom made especial effort to consult personally all the originals and verify each reference. It is but natural, since Dr. Woglom was for some years a highly-valued assistant of the Imperial Cancer Research Fund, that this fact, and the close association with his colleagues, have led to full recognition of the work of the Imperial Cancer Research Fund; but it was Dr. Woglom's aim that no injustice should thereby be done to any other worker or centre of cancer research.

Vol. i., unlike vols. ii., iii., and iv., has been issued not only as a large quarto, but fortunately in octavo form at the same price. This is really a boon, because by simply cutting off the large margins Dr. Woglom's book has been reduced by more than two pounds dead weight, viz., from more than four to less than two pounds.

It is noteworthy that throughout the three large volumes reviewed, the question of the etiology of cancer is nowhere seriously raised from the viewpoint of a possible "cancer parasite." Cancer is regarded as a problem of growth, and the question of a *stimulus* to growth (a growth hormone in Starling's sense), is frequently and often ably discussed. But in the light of experiment it appears to the reviewer that the question should also be considered from the point of view of the absence or withdrawal of resistance to growth, of "chalones" in Schäfer's sense, if it be justifiable so to extend the term.

E. F. B.

A NEW TACTICAL TREATISE.

The Principles of War. By Major-General E. A. Altham. With an Introduction by General Sir H. L. Smith-Dorrien. Vol. i. Pp. xv+436+maps. (London: Macmillan and Co., Ltd., 1914.) Price 10s. net.

GENERAL ALTHAM has produced the first of a series of volumes on major tactics, under the title of "The Principles of War." Although the fundamental principles of war are neither very numerous nor in themselves very abstruse, their application is difficult. War is not

an exact science, and cannot be reduced to a series of mathematical formulæ. All that can be done is to deduce from actual experience certain broad principles, and leave it to study and to practice to create an instinct in the mind of the soldier for their correct application to the circumstances of the moment.

But tactics are constantly affected by the progress of science, and disaster may ensue if its effect is not correctly appreciated. In peace there is no means of putting modern appliances to the ultimate test of battle, and imagination must necessarily play so large a part in peace preparation for war, that there is always a danger of fundamental principles being obscured by an exaggeration of the effect of new inventions. Thus General Altham ascribes the French defeats in 1870 to the false theory they had formed that the improvement in the rifle favoured defensive tactics, a theory which ignored the national characteristics of the Frenchman, and committed the French armies to a fatal cult of positions.

General Altham's object in this volume is to illustrate from history the doctrine which the General Staff has laid down for the guidance of the Army, and thus constantly to remind students of the necessity for assigning due importance to the lessons of the past in these days of rapid and far-reaching changes in war material.

Field Service Regulations and the training manuals, which contain this doctrine of the General Staff, while entirely complete in themselves, are necessarily somewhat condensed in form. Field Service Regulations, Part 1, in particular—a 220-page summary of the art of war—every word of which has been carefully weighed, and no single sentence of which could be removed without material loss, may seem to be strong meat to many, and is apt to cause a species of mental indigestion if taken in too large doses. The senior officers of the army will remember, possibly with gratitude, that they were more gently nurtured on the pages of Home and Clery.

General Altham's work bids fair to take the place of these authors on the bookshelves of the younger generation of soldiers. His method is to take a series of texts from Field Service Regulations, and to preach a sound and simple sermon on each of them, impressing his lessons on the mind by one or more graphic illustrations drawn from the campaigns of the last half century. *En passant*, we express the hope that he may be able, both in his subsequent volumes, and in the later editions of this one, to draw more extensively for illustration upon the recent operations in the Balkans.

The book commences with a chapter which should appeal particularly to officers of the British Army, for it discusses those moral qualities which, as a factor of success in war, count for so much more than mere numbers. The bulk of the volume is occupied by ten chapters on the characteristics of the various arms of the service; within these will be found some interesting remarks on mounted infantry, the rôle of the cyclist, and the possibilities of aircraft. The remaining chapters deal with such subjects as inter-communication, orders, movements, and billets, all of which will be of particular interest to officers serving, or aspiring to serve on the staff.

But though we are satisfied that General Altham has supplied a much-felt want, we are constrained to sound a note of warning. He expresses the opinion that the study of military history is but imperfectly appreciated by the army at large, and the purpose of his book is doubtless to stimulate officers to read and re-read the campaigns of the great commanders, and that too with greater profit to themselves than in the past. His purpose is wholly commendable. At the same time, we cannot conceal from ourselves the danger, inherent in any volume of this character, that it may be regarded by some as a convenient gold mine of "nuggets" from which to cram for examination purposes, and that, in so far as these officers are concerned, the volumes of military history which are to be found in the well-stocked shelves of every garrison library, may continue to lie there even more neglected than General Altham says they do at present. We trust, however, that our fears on this point may prove to be entirely groundless.

LIFE AMONG THE ESKIMO.

My Life with the Eskimo. By Vilhjalmur Stefánsson. Pp. ix+538+plates. (London: Macmillan and Co., Ltd., 1913.) Price 17s. net.

THE expedition conducted by Mr. V. Stefánsson and Dr. R. M. Anderson along the shores of the Arctic Ocean is remarkable in the fact that for four years they lived on the country, as the Eskimos do, and trusted little to any stores procurable in Canada, except ammunition. Mr. Stefánsson had prepared himself for this undertaking by a previous journey during which he lived with the Eskimo, supported himself on their food, and learned their language. The result was satisfactory, though even his cheery account of their adventures shows that they were exposed to much danger and privation. Only exceptional travellers can survive under such conditions.

John Rae, he remarks, wintered in this manner at Repulse Bay, within a decade of the time when Sir John Franklin's party perished from want in a country occupied by Eskimo, who existed in comparative plenty, unaided by the muskets and other implements which the English possessed in abundance.

The country explored by this expedition extends from Point Barrow in North Alaska, including the valleys of the Yukon and Mackenzie rivers, to Victoria Island, where the most interesting discovery was made. This region was crossed along the seaboard in various directions; large collections of ethnological material, and of the minerals, flora, and fauna were made. These collections are described in a special appendix by Dr. R. M. Anderson, which deals with many interesting and novel specimens. Many of the charts of this region were found to be untrustworthy, and Mr. Stefánsson's surveys furnish a basis for more correct delineation of the coast-line and of the river deltas than was hitherto available. He gives also a useful account of the Eskimo language and its dialects.

The most important part of the book is the account of the comparatively fair tribe of Eskimos encountered in Victoria Island. Some individuals have blue eyes, light brown beards, and dark brown or rusty-red hair. They are clearly distinguished from the true Eskimos by the facial index, which in the latter is about 101, while in the Victoria Island tribe it falls to 97. Mr. Stefánsson discusses in detail the origin of this remarkable tribe. He dismisses the supposition that they can be derived from survivors of the Franklin or other European expeditions, or from Russians in the Alaska region. He traces the Scandinavian settlements in Greenland from the time of Eric the Red at the close of the tenth century of our era. The route from Greenland to Victoria Island occupies a year by boat, two years by sled. There is thus no objection to a westward movement of half-blood Eskimos. On the whole, he seems to regard this solution more probable than the supposition that this blond type may have been accidentally produced, while the influence of environment cannot account for the facts.

This book will take a high place in the literature of Arctic adventure. It is written in a graphic, modest way, and the tact and endurance of the two explorers deserve hearty recognition. The route map might be improved by the addition of the European to the Eskimo place-names, but the photographs really assist in realising the conditions of the enterprise.

OUR BOOKSHELF.

Interpretations and Forecasts: a Study of Survivals and Tendencies in Contemporary Society.

By Victor Branford. Pp. v+411. (London: Duckworth and Co., 1914.) Price 7s. 6d. net.

"The city," said Aristotle, "exists for the sake of the good life." But only by the good life is the ideal city, the perfect state, to be realised. In other words, social organisation is necessary for individual achievement, but individual achievement reacts creatively upon the social organisation. Mr. Victor Branford, one of the founders of the Sociological Society, has with his spiritual father, Prof. Geddes, done much to illustrate this essential interaction, and still more to infuse a sense of enthusiasm into our appreciation of it. He shows in these lectures the spirit of the medieval guildsmen, who knew themselves to be citizens of no mean city. On their work and ideals he writes a delightful and instructive essay.

The text of the whole book is Aristotle's theory of the city. The author well shows how, as a result of the statecraft of the Renaissance and subsequent centuries, a "capital literary fraud" was perpetrated upon that theory. Aristotle saw the city as "a process in which four types of social operation tended to co-adjustment. He saw the Labour of the People, who maintain the outer life of the city; he observed the Public Functions of the citizens, who direct the polity of the city; he perceived the Meditations of Philosophers, who study and compare the polities of cities in order to discover the ideal polity; he recognised the Efforts of Teachers to educate for citizenship. In proportion as all these—the four natural elements of civic life—work together harmoniously, the city comes into being and creates for its citizens the conditions of the good life." The fraud perpetrated upon this theory is the substitution of "state" for "city"; "politician" for "citizen"; "constitution" for "polity"; "political" for "civic"; and "for the science and art of Civics they have substituted Politics." A reaction towards the original and sounder view is to be seen in the decentralising movement of to-day. The author is familiar with the life both of North and South America, and his comparisons of the working of a new spirit in the western republics and in European countries are marked by insight. The place of education in developing the ideal and therefore most efficient relation between man and society, in its most practical because closest and best realisable form, the city, is very fully worked out.

The book is an eloquent example of the practical application of sociological theory.

A. E. CRAWLEY.

The Country Month by Month. By J. A. Owen and Prof. G. S. Boulger. Pp. x+492. (London: Duckworth and Co., 1914.) Price 6s. net.

TWENTY years ago Mrs. Owen, better known, perhaps, by her works under the signature "A Son of the Marshes," prepared, with Prof. Boulger, a series of twelve volumes in which the natural characteristics of the country month by month

were described. The series was published in a single volume in 1901, and was given an appreciative notice in these columns (vol. lxx., p. 125). The late Lord Lilford sent the authors a number of valuable notes which were added to the original work, and are also included in the present volume. The new edition has been revised, and is embellished with twelve coloured plates and twenty half-tone plates reproduced from photographs. The result is a very attractive book on popular natural history. Many similar books have been published in recent years, but for pleasantly-written description of country life, interesting alike to the general reader and the working naturalist, this volume is among the best. In its present form the book should be acceptable to a wide circle of readers.

LETTERS TO THE EDITOR.

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

Migration Routes.

ON November 27, 1913, NATURE published a letter from me in which the suggestion was made that birds when migrating may find it advantageous to follow coast lines or rivers, because of the up-air currents produced by the difference of temperature of the surface of the land and water.

Mr. McLean has recently flown up the Nile, and he tells me that the vertical air currents were frequently very marked. When the wind was only slightly different in direction from the line of the river there was a down current on the side from which the wind came and an up current on the other side. When, however, the river split up into several channels the air was generally descending over the whole neighbourhood and was disturbed. These down currents were at times so strong that his aeroplane when climbing at its greatest speed would descend steadily at 3 ft. per second. He estimates that the maximum rate of climbing of his machine in still air was 4 ft. per second. This observation is of great interest as showing that a down current may exist of about the velocity of 4.8 miles per hour.

HORACE DARWIN.

The Orchard, Cambridge, June 8.

Aeroplane Wings.

IN connection with the apparently growing practice of constructing the wings of aeroplanes so that their inclination can be modified (a scheme which I recommended in the first edition of my book, "The Problem of Flight," published in April, 1907), may I direct attention to my paper read at the Dundee meeting of the British Association in 1912? Therein I referred to the fact that the propeller axis (to which the inclination is, or should be, referred) does not run horizontal so that the propeller thrust has a vertical component. The use of a mechanism by which the wing inclination can be varied enables this vertical component to be annulled, *i.e.* the propeller axis can be kept horizontal, thus greatly increasing the efficiency.

With reference to the question of acceleration in the air and its effect on the reactions, which was discussed some time ago in NATURE in connection with Mr. Walkden's book, a recent paper of mine in *Flight* on oscillating wings may be of interest. It was shown therein that if the reactions during oscillation of the

air current vary as the square of the relative velocity, the mean reaction is greater than that due to the mean velocity considered as steady.

HERBERT CHATLEY.

Chinese Government Engineering College,
Tangshan, North China, May 24.

Weather Forecasts in England.

MR. MALLOCK, in giving his reasons for believing that correct weather forecasts are not likely to be possible even for twenty-four hours in advance, touches upon many very debatable meteorological theories.

His diagram purporting to show the surface wind currents for an earth, the surface of which is level and uniform, requires for its prediction a much better knowledge of the actual cause of wind distribution than we possess at present. Indeed, at the present time, it would appear that the wind conditions he shows are more nearly those of the northern than the southern hemisphere, and rather are the result of the irregular distribution of land, sea, and mountain than to uniform surface conditions. In the southern hemisphere the conditions, as near the equator, approximate more to belt than to cyclonic conditions.

An inspection of the daily weather charts issued by the Meteorological Office will also show that the general directions of the winds over the northern hemisphere are by no means as Mr. Mallock shows. A cyclone is a much more complex affair than the whirls of his figure. Cyclones are generally rather the result of the common action of several winds moving in different directions. Not only is this the case, but we have no accepted theory as to the cause of cyclones and the source from which they derive their energy.

If it were a simple matter of the passage and rapid appearance and disappearance of cyclones, as Mr. Mallock supposes, I take it that the weather conditions would be rapid alternations of sunshine, cloud, and rain. But such is not the case. We have long periods of fine weather, long periods of wet, unsettled weather, and spells of heat and cold. We must recognise the fact that on the earth we have regions where the weather conditions vary regularly with the seasons, and we also have insular and oceanic weather conditions. The boundaries of these areas are not always the same. The one is apt to encroach upon the other, and it is probable that by obtaining a knowledge of such general movements, weather forecasting for considerable periods of time will be possible.

So long as the old ideas of cyclones and anticyclones held sway, weather predicting really seemed hopeless; but fortunately we find that these old theories, though expressing important truths, require considerable modification in detail. Mr. Mallock's contention that useful forecasting will never be possible seems premature in face of the fact that there are so many things taking place in weather changes the theoretical reasons for which are unknown.

With improved weather charts will come a better knowledge of the theory of cyclones and anticyclones. However, it may never be possible to predict, from the to-be-discovered laws of the winds, the course of weather changes with the certainty the movements of the members of the planetary system can be predicted by the application of Newton's laws.

R. M. DEELEY.

Abbeyfield, Salisbury Avenue, Harpenden.

The Thunderstorm of June 14, at Dulwich.

My observations on the thunderstorm of Sunday, June 14, at Dulwich, may perhaps be of interest.

Thunder was first heard a little before 12.30 p.m., and lightning was seen from about 12.45. These

continued more or less throughout the afternoon until quite 5 o'clock, the lightning being very brilliant and rather frequent. Heavy rain fell from 12.50 until 1.10, and from 1.15 to about 2.20. Some white hail fell about 1.45.

At 2 p.m. there was a heavy fall of big hailstones as large as marbles, which lasted about five minutes. Many of these hailstones were like large acid tablets, about an inch long, half an inch broad, and more than a quarter of an inch thick. The hailstones were composed of perfectly clear ice, and did not contain any white opaque substance. Hailstorms are usually accompanied by gusts or squalls of wind; in this storm, however, there was but little wind.

When the big hailstones fell the leaves were torn off the trees, and so the pavements immediately beneath them became quite green with the fallen leaves. The heavy rain, however, quickly washed these away, so that they were carried into the gutters and soon stopped up the drains, with the result that the roads were flooded.

A minute or two after the big hailstones had fallen, a mist arose above the roads and pavements to a height of about 4 ft. This clearly showed how the fogs were formed near the Banks of Newfoundland owing to the mixing of the cold and warm sea current.

Rain came on again about 3.15, and continued until 4 p.m.

It was not able to get to my rain-gauge in Alleyn Park until after 5 o'clock, as the lawn was flooded and the water had not subsided sufficiently for me to get into the garden. I found the rainfall to be 2.15 in., and of this amount I believe that about 1.60 to 1.75 in. must have fallen in three-quarters of an hour, from 1.30 p.m. to 2.15 p.m.

WM. MARRIOTT.

Royal Meteorological Society, 70 Victoria Street,
London, S.W., June 16.

A Dual Phenomenon with X-Radiation.

SINCE our paper on the "X-Rays and Concentration," and our exhibition of models and negatives at the annual general meeting of the Röntgen Society on June 9, we have obtained further results which favour the hypotheses then suggested.

For instance, if a radiograph be taken at any incidence (except 0° and 90°) of a ring of rectangular cross-section made in ebonite, its circular edges will be distinctly visible as black and white *semi-circles*. These alternate for the top and bottom outer rings, and they are in the reverse order for the inner circles. These differences were predicted from the generalisation we gave in the paper. We think it would be advantageous to repeat the conclusion of the paper for those who were not present at the exhibition:—

"Generalising our results, it would seem that when X-rays are incident (or emergent) simultaneously upon two surfaces having a common boundary, this will be marked by a white or black band according as the dihedral angle of the solid is greater or less than 180° . If, however, the rays are incident upon one of the surfaces only, and emergent from the other, the order is reversed. In the third case, where the rays are incident upon one surface but parallel to the other (as with single laminæ) the two bands appear in close association, and are observable with difficulty without the aid of suitable magnification." Tangential radiation has given a black or white band according as the surface was convex or concave.

I. G. RANKIN.

W. F. D. CHAMBERS.

90 Gordon Road, Ealing.

LEGISLATION AND THE MILK SUPPLY.

MILK legislation, as represented by the Milk and Dairies Bills of 1909 and 1912, has so far been characterised by a want of definiteness which has probably been the cause of much of the opposition which it has aroused. This opposition has come about both from the peculiar character of the requirements laid upon the medical officer of health in connection with the inspection, etc., of dairies and cowsheds, and also from the trade itself, on account of the omission of any practical attempt in the earlier Bill to deal with some of the evils which everyone desires to see put right, and from a feeling of uncertainty as to what might happen under the rather extensive powers which that Bill gave to public health authorities. For these reasons the President of the Local Government Board found himself assailed both by the medical officer of health and by representatives of the trade, with the result that in both cases the Bill was eventually dropped. Many of the controversial features of the earlier Bill to which attention was directed were rectified, to a certain extent, in the Bill of 1912, but the powers, etc., of the medical officer of health were not made particularly clearer, and there was still no definite assurance that reforms would be carried out in a satisfactory manner. The chief objection which was raised to both these Bills was that with regard to the principal evils for the rectification of which legislation is so greatly needed, amendment was left in the hands of the Local Government Board by the issue of regulations *after* the passage of the Bill, and apparently without consultation with anybody.

The problem of drafting a satisfactory Bill is likely to be more difficult than previously, for the conditions of milk supply have changed considerably during the last five years, and the attitude of the farmer must be considered for the successful issue of any milk legislation. It is probably a necessary concomitant of all legislation that it should largely deal with pains and penalties towards those who do not carry out its requirements, but legislation ignores the fact that those so threatened may clear themselves from the fear of such penalties by ceasing to come under the legislation in question, and this is exactly the situation which it is necessary to realise has arisen of late in the milk trade. The farmer, at the present time, is probably rather independent as to whether he produces milk or not. In any case, a large quantity of milk is being produced for purposes other than ordinary milk supply, and these diversions of milk are becoming greater, and it may not be necessary that the same care should be taken with regard to milk which is used for such purposes, as would be the case if the milk were directly used as food material.

To those who are accustomed to deal with farmers on a business basis, it is evident that any attempt to carry out drastic or theoretical alterations in connection with the production of milk would simply result in intense opposition, and a great increase in price for the article supplied.

There is at the present time almost a trades unionism among farmers, by means of which the wholesale price of milk, for no justifiable reason, has been gradually increasing during the last three or four years, and as there appears to be no power which may be invoked which will prevent the farmer increasing his price indefinitely, he would be only too pleased to have some really sound reason to bolster up his present attitude. For this reason the provisions in the earlier Bills which make it incumbent upon the medical officer of health and the sanitary authorities to carry out farm inspection is probably a mistake. The medical officer of health, as a rule, will have little knowledge of farms, cows, and their surroundings, and there usually will be a lack of sympathy between him and the farmer. One looks upon the other as an ignoramus, and the latter regards the former as a theoretical person who knows nothing about the farmer's business. Though the production of a new type of official is to be deprecated, if a special course in sanitary science were added to the ordinary veterinary course, on lines similar to the post-graduate courses which enable a medical man to obtain the diploma in public health, there is no reason why the younger generation of veterinary surgeons should not become amply qualified to carry out farm inspection, while their training would gain for them the respect and sympathy of the farmer.

It is quite certain that much of the present condition of milk production in the country arises more from ignorance than from deliberate intention, and certainly for a year or two after the introduction of any legislation dealing with the production of milk, it would be desirable to proceed with caution, and on the lines of advice and help, rather than upon those of compulsion. Among the younger generation of farmers there are many who will be better able to appreciate the requirements of modern milk production than their forefathers; but as they will probably inherit the typical British obstinacy of the farmer, it would be necessary that they should be led rather than driven.

It must not be forgotten also that the question of improvement of milk production, particularly as regards premises, water supply, etc., is much complicated by the attitude of the owners of the farms, who may be disposed to get rid of farmers from their premises rather than to carry out any very considerable improvements which might be required of them in connection with milk production for food.

It is important in any Bill that the prohibition of the addition of colouring matter and preservatives of any kind should be made, as well as of the addition of skimmed milk to ordinary milk; and with this last might be coupled a further regulation that notices to the effect that such admixture is illegal should be posted in all dairies, in order that employees as well as employers should fully understand that such a regulation is in force. At the present time, a large amount of skimmed milk is

added to ordinary milk, and such a practice is likely to continue if the present wholesale price of milk holds. Such admixture makes it exceedingly difficult for the honourable trader to compete with his less scrupulous rivals. It would also be well if some regulation were introduced dealing with the question of pasteurisation, and it should be made compulsory that all milk which is pasteurised for sale and constitutes more than, say, 25 per cent. of the total quantity of mixed milk sold, should be labelled "pasteurised," or the knowledge that it has been pasteurised in some way conveyed to the consumer. There is no doubt that the practice of pasteurisation is spreading on account of the more independent and careless attitude of the farmer.

It should also be possible for distributors receiving milk from farmers to ask the public authorities to take samples of any farmer's milk, which for any reason is believed to be adulterated, at the stations on arrival, and for such samples to be analysed, and the proceedings taken against the farmer when necessary, without in any way the name of the distributor being brought into the question, as the present conditions of milk supply have brought about a position such that the farmer may, if troubled too much by any particular distributor, refuse, on a future occasion, to supply milk to him, and may also very probably notify farmers in the neighbourhood that such and such a buyer is an exacting person or concern, with the result that those distributors who are endeavouring to preserve a high standard may become boycotted.

There appears to be at the present moment a favourable attitude towards the idea of grading milk. However well this may work in America, the result of selling milks of different grades in England will be that milk will deteriorate to the lowest grade, with the exception of quite a small quantity which a few people who wish for milk of a better quality will take. There is plenty of evidence at the present time that the general public buys milk simply on a basis of its price, and without any regard to its quality or source, and it would be most unfortunate if the sale of a low-grade milk were possible. History would repeat itself in this as it has in the case of water in butter, which, since it was made legal to sell 16 per cent. of water in butter, has gradually risen to this limit, though previously the greater number of high-class butters had a considerably smaller percentage of water than 16 per cent. The ordinary householder does not want to be bothered to consider what grade of milk he ought to purchase; he desires to obtain milk which is a reasonably sound commodity which he can consume, without cause for serious apprehension, in the raw state in which he generally prefers it.

A further, and what may prove a serious, obstacle to the improvement of the milk supply looming in the near future, results from the fact that a trades union of milk carriers has recently been formed. One of the principal planks in their platform is that there should be only one delivery

on Sundays, which, though quite a laudable idea in itself, would inevitably lead to great deterioration in the bacteriological quality of the milk supplied on Mondays; and from the general attitude of the labour mind, if this point were achieved, it would doubtless occur to them that one delivery every day might also be sufficient, with disastrous results so far as the ordinary milk supply is concerned.

It is one thing to legislate and quite another thing to put such legislation into operation when there are such determined labour forces opposing progress. There is no more regrettable feature of the labour world to-day than the steady decay of high principle and honesty of purpose which is making it all but impossible to carry out satisfactorily such rules and regulations as are so necessary in the handling of milk. It is necessary to sue as a favour for that which ought, with right-minded men, to be expected or demanded as a right. This careless attitude, combined with an ignorance of the elementary rules of cleanliness, render the handling of milk a source of constant and harassing worry to the managers of large dairies.

There is also a great lack of cohesion among milk dealers themselves which makes any combined effort for good very difficult of accomplishment, and it must be said with regret that there is also a lack of a right and high ideal in many quarters.

Reverting to the question of legislation, it is desirable that measures should be taken to put a stop to the type of dairyman who carries on his business surreptitiously, who emerges from obscurity when there seems a chance of making some profit at the expense of the legitimate trader, peddles a liquid which has a quite uncertain relation to the cow (and would never be bought by anyone if it were not sold cheaply), and retires again into obscurity when it becomes unprofitable to continue.

With regard to regulations concerning the procedure to be observed in the milking, etc., of cows, the greatest simplicity is essential if there is to be a chance of such procedure being carried out in any real sense, as the times and seasons at which milking has to be done are not conducive to the development of any great enthusiasm with regard to care on the part of the milker. It is hard enough to obtain milkers at the moment, and any great addition to the labour of milking might easily result in a very real dearth of such men. This is, again, a case for careful and patient education rather than for the thunders of legislative pains and penalties.

No Milk Bill has yet shown the least attempt to bring the railway companies into a proper state of mind as to the necessary care and expedition in the carriage of milk.

Since the above was written a new Bill has been introduced into the House of Commons by Mr. Herbert Samuel. Its principal clauses, like its predecessors, are those requiring regulations to be made by the central authority with regard

to the inspection of cows, cowsheds, and milk shops, the prevention of infection and contamination of milk, the mixing of milk with separated milk or other substances, and conditions of storage and transit. These regulations apparently are to be enforced by a new set of authorities—the county councils instead of the district councils—which is a step in the right direction, and by means of a staff which, in addition to the medical officers of health, is to include veterinary officers and bacteriologists. A sound principle is likewise adopted by making each authority responsible for the milk produced in its own area, and also by enabling the authorities in the town to requisition action by the authorities in the country as a result of bacteriological or other sufficient evidence against the milk. A clause in the Bill introduces a drastic change in the practice of dealing with adulterated milk. Milk is now to be regarded as genuine, however low the percentage of fat, provided it can be proved that it has not been tampered with after leaving the cow. Though not perfect, the present Bill is undoubtedly an improvement on its predecessors, but there seems little prospect of its passing during the present session of Parliament.

R. T. HEWLETT.

THE COMMEMORATION OF ROGER BACON AT OXFORD.

THAT the year 1214 saw the birth of Roger Bacon is rather a matter of probable inference than of certainty. There is, however, good evidence that he died in 1292, and was buried on St. Barnabas' Day (June 11) in the precincts of the Grey Friars at Oxford, a quarter of the city which is now known as Paradise Square. Hence there was sufficient reason for the celebration at Oxford on June 10 of what was called the "seventh centenary" of the great Franciscan, and for the gathering together of representatives from many parts to do honour to the memory of one who, as the unflinching advocate of experimental science as against authority, was held by Humboldt to be "the most important phenomenon of the Middle Ages."

No record appears to exist of the characteristics of Bacon in form and feature. In the statue, however, which was unveiled at the University Museum on June 10, Mr. Hope Pinker has contrived to give the impression of alertness, shrewdness, and pugnacity—qualities which his subject most certainly possessed in full measure. The face also carries a suggestion of humorous depreciation, which sits not inappropriately on the effigy of the man who professed to be able to teach anyone to read Greek in three days, and who would fain have burned all the then existing translations of Aristotle. But whether the sculptor has or has not succeeded in reconstructing the bodily aspect of the real Roger, a point which can never be decided, there is no doubt as to the accuracy of his presentation of the Franciscan garb, or of the astrolabe held in the strenuous grasp of the friar.

In his speech preparatory to the unveiling, Sir

Archibald Geikie laid due stress on the greatness of Roger Bacon as a pioneer of the experimental method in science. "Dispensing with the futile disputational subtleties of the schoolmen of his day, he strove to concentrate attention on things rather than words. He led the way towards the conception of science as the inductive study of nature, based on and tested by experiment." A similar note was struck by Lord Curzon, who in his capacity of Chancellor accepted the statue on behalf of the University of Oxford. After recounting the various branches of learning which Bacon had studied and on which he had written, a list which includes not only nearly all that we understand by physical science, but also moral and political philosophy, the Chancellor went on to



Roger Bacon Statue in the University Museum, Oxford.

point out that in these sciences Bacon was not a mere amateur. "He did not dabble with them, so to speak, in holiday hours, but studied them profoundly." Moreover, he wrote with intense conviction about their essential interdependence one on the other.

Following the ceremony of unveiling, an address was delivered by the Public Orator of the University, Mr. A. D. Godley, of Magdalen College. In elegant Latin periods the orator paid tribute to the diligence and fearlessness which had enabled Roger Bacon to accomplish a great work in the face of difficulties. Turning towards the statue, he exclaimed:—

Welcome, Friar Roger, on your return to Oxford! You here behold the fruit of your labours. . . . Henceforth may your bodily likeness stand in that shrine of science where we witness the fulfilment of your prayers

and wishes. May the spirit that inspired you abide with us everywhere and always: may it preserve our understanding from the bonds of error, and by its presence strengthen and confirm us in the pursuit of the truths of nature.

The ceremony at the museum concluded with the presentation of addresses from the University of Cambridge and from the Franciscan Order of Friars Minor, the former by Prof. James Ward, the latter by Fr. David Fleming.

At a luncheon which was given by Merton College, the Warden presiding, the memory of Roger Bacon was proposed by the Bodleian Librarian (Mr. F. Madan), who took occasion to mention the west-country origin of the subject of the toast, and the encouragement which he received from Pope Clement IV. This was supported in an eloquent speech by M. F. Picavet, representing the University of Paris. The other delegates were welcomed by the Chancellor, and replied to the toast of their health in speeches of great interest. The delegate of the Vatican Library, Monsignor Ratti, speaking in Latin, announced the recent discovery of a new Baconian manuscript. The Comte d'Haussonville and M. Henneguy, both members of the French Academy, answered respectively on behalf of the Institut and of the Collège de France. Fr. David Fleming spoke for the Franciscan Order, and Prof. James Ward for the University of Cambridge. Sir W. Osler conveyed the thanks of the company to the Warden and Fellows of Merton College.

Many of the visitors attended the Romanes lecture on "The Atomic Theory," given by Sir J. J. Thomson. Others proceeded to the Bodleian, where the librarian had arranged an exhibition of Baconian books, prints, and manuscripts. This comprised MSS. of the *Opus Majus*, the *Opus Tertium*, and fragments of the *Opus Minus*, together with many other MSS. of interest, including the curious treatise "de retardandis senectutis accidentibus." The volume of memorial essays lately published under the editorship of Mr. A. G. Little was also on view.

The events of the commemoration ended with a party in the garden of the Warden of Wadham College.

F. A. D.

ADDRESS TO THE UNIVERSITY OF OXFORD.

The following is the address written by the Public Orator of the University of Cambridge, and presented by Dr. James Ward at the celebration:—

Gratulamur Universitati vestrae, viri litterarum et scientiarum omnium amore nobis coniunctissimi, quod annum septingentesimum ex quo natum est scientiarum et litterarum lumen illud vestrum, Roger Bacon, mense proximo vosmet ipsi, cum aliis quibus alumni vestri memoria cara est, celebrare constituistis.

Viri tanti fama ad posteros quam tarde pervenerit, non ignotum. Scilicet anni intercesserant trecenti, cum libellus de mirabili potestate artis et naturae ab eo conscriptus, typis expressus est; quadringenti sexaginta sex, cum eiusdem *Opus Maius* publici iuris factum est; prope sescenti denique, cum *Opus Minus* et *Opus Tertium* diei lucem primum viderunt. Opera autem eius tam multa tamque late dispersa fuisse

perhibentur, "ut facilius sit Sibyllae folia colligere," e quibus nonnulla, vixdum nota, vosmet ipsi, cum aliis coniuncti, in lucem mittere decrevistis. Atqui, etiam in libris eius, quos iam dudum habemus, luce clarius est, quanto litterarum Graecarum, Hebraicarum, Arabicarum, quanto scientiarum omnium amore flagraverit, qui, quanquam scientiae uni potissimum investigandae annos decem dedicavit, ceteras nequam neglexit, scientias omnes inter se connexas esse, et mutuis sese fovere auxiliis, non immerito arbitratus.

Idem quam multa, quae nostra demum invenit aetas, mente sagaci prospexit, Senecae sui verbis illis praeclearis usus:—"veniet tempus quo ista quae nunc latent, in lucem dies extrahat et longioris aevi diligentia." Vaticinium etiam alterum nunc demum auspiciis vestris verum redditum est. Etenim, abhinc annos plus quam trecentos, poeta quidam Cantabrigiensis praedixit, fore aliquando, ut Anglia et Europa Baconis vestri famam admirarentur, atque ut Oxonia praesertim alumnium suum statuarum honore in perpetuum celebraret. Ergo etiam posteros iuvabit Historiae Naturalis in Museo vestro iuxta Baconis nostri imaginem etiam Baconis vestri statuam non sine reverentia contemplari.

Has litteras benevolentiam et observantiam nostram testantes legato maxime idoneo, philosophiae e Professoribus nostris altero, ad vos perferendas tradimus. Valete.

THE COMMITTEE ON WIRELESS TELEGRAPHY RESEARCH.

THE appointment of the committee on wireless telegraphy research, and its report, referred to in last week's issue of NATURE (p. 385), are indications that the somewhat fierce light that the Marconi inquiry brought to bear upon the unscientific methods of the Post Office is at length having some effect. No longer is it possible that a high Post Office official should annotate a memorandum, prepared by a very responsible technical officer, recommending the appointment of some engineers destined to form a skilled wireless staff, with a paragraph to the effect that "common-or-garden" engineers are good enough for wireless telegraphy. To the Marconi committee, however, Sir Alexander King, secretary of the Post Office, admitted that the office could not undertake the design and erection of the imperial wireless stations for the reason that they had in their employment no one with the necessary knowledge and experience, surely a very humiliating position for the State department which controls the whole of the national telegraphs, with a large technical staff, and spends thereon huge sums of public money.

Since then it is satisfactory to note some change in the official mind, first in the appointment, some months ago, of Mr. Duddell to assist the telegraph department with technical advice, and secondly in the appointment of the very representative committee of which the report is now under review.

The report now published is in favour of establishing, near to the National Physical Laboratory at Bushy, a special national research laboratory where work on wireless telegraph problems will be carried on, while investigations in connection with ordinary telegraphy and telephony will not be excluded. The laboratory is to be controlled

by a national research committee consisting partly of representatives of the Post Office, Admiralty, War Office, and Treasury, and partly of paid members nominated for short terms of years by the Royal Society and the Institution of Electrical Engineers, together with the director of the National Physical Laboratory.

As the capital cost of the laboratory is estimated at only 7,300*l.*, and the total annual expense, both of laboratory and committee, at only 4,800*l.*, sums which are very small in comparison with the possible savings that such a research laboratory ought to be able to assist in effecting in the vast annual expenditure on the national telegraph service, the proposals cannot be considered in any way extravagant. Indeed, if anything, they appear to err on the side of insufficiency. For instance, the secretary of the proposed research committee, who, in addition to possessing the usual qualifications for such a post, including a knowledge of French and German, is to be a man of technical training and experience, is only to divide 300*l.* per annum between himself and a clerk. Again, the principal assistant, who must obviously be a first-class technician, as he is to have complete charge of the laboratory under the director of the National Physical Laboratory, is only to get a salary of 400*l.*

Further, it is suggested that the honorarium given to each of the paid members of the proposed committee for their attendance at meetings is to be fixed at ten guineas a meeting, it being proposed that during the first two years there will probably be fifteen meetings per annum, and after the first two years ten meetings. No doubt eminent men of science will be found ready to give their time to the State at this rate of remuneration, as equally would they no doubt be found to do so for nothing; but it may be pointed out that this amount of pay suggested for the committee, presumably for men of the highest scientific capacity and experience, is only about one-half what the average company director, who may have no special experience or training, commonly obtains for attending the board meetings of medium-sized companies in the City of London. The fact that Sir Alexander King, the secretary of the Post Office, and Mr. R. Wilkins, of the Treasury, are of opinion that the payments suggested are on too liberal a scale, is significant evidence of the low value that non-technical Government officials attach to scientific attainments.

However, the recommendations contained in the report, if adopted by the Government, will be a beginning in the right direction, and it is satisfactory to know that similar arrangements in connection with the advisory committee for aeronautics, established in 1909, of which the research work is carried out in the National Physical Laboratory, are working well. It will always be open to the research committee, when once it is established and has had time to prove the value of its work, to point out that with ampler resources it could do more.

A. A. CAMPBELL SWINTON.

THE URGENT NEED FOR ANTHROPOLOGICAL INVESTIGATION.¹

THE Carnegie Institution of Washington has taken the wise step of inviting certain experts to report on the special needs of anthropological investigation, and have printed the reports of Dr. W. H. R. Rivers, F.R.S., Prof. A. E. Jenks, and Mr. S. G. Morley in a sumptuous *brochure*.

Dr. Rivers lays particular stress on the special urgency of the needs of anthropology, due to the character of its material, this factor of urgency being wholly or almost without importance in other branches of science. Only exceptionally can the investigation of archæological problems be regarded as urgent, and he believes that science will gain in the long run by delaying archæological exploration. He contrasts with this the case for ethnology, and adds, "In many parts of the world the death of every old man brings with it the loss of knowledge never to be replaced." He contrasts "survey work" with "intensive work," and proves the importance of the latter. The most favourable moment for ethnographical work among any given people is discussed, and the different kinds of agencies by which ethnographical work is now being carried out, his remarks on investigations by officials and missionaries being both just and sympathetic.

Preliminary training in scientific methods is essential, and Dr. Rivers agrees with Friederici that investigators working alone seem to obtain more valuable results than expeditions comprising a whole staff of experts. "The work of an expedition will attain its highest efficiency if it seeks to combine the advantages of individual enterprise with the work of specialists where this seems indispensable." Collecting expeditions for the enriching of museums rarely accumulate any intimate knowledge of the natives that is of much value; indeed their tendency is unconsciously in the opposite direction. Everything which the intensive worker obtains will have an infinitely wider and deeper meaning than anything which can be obtained by the cursory visitor, and the processes of manufacture can be collected, which are even more important than the finished article.

Physical anthropology can be postponed till a later stage of the inquiry. It follows that the prime need of anthropology is for the intensive investigation of those living examples of human culture which are most likely to disappear or suffer serious decay. Dr. Rivers then makes a brief survey of different regions of the globe outside America, with the object of ascertaining the urgency of the needs, and how far these needs are being met by existing agencies. "Perhaps the most urgent needs for Europe are for the study of the existing cultures of Lapland in the north, and of the countries of its south-eastern corner, and especially of Albania." The pressing need for research in South Africa "stands beyond all question." The ethnological problems of Asia, except

¹ Reports upon the Present Condition and Future Needs of the Science of Anthropology. Presented by W. H. R. Rivers, A. E. Jenks, and S. G. Morley. Pp. 91 + 14 plates. (Washington, D.C.: Carnegie Institution of Washington, 1914.)

perhaps in a few places, are regarded as presenting no special urgency. The same applies on the whole to Malaysia, where very little intensive work has been done as yet. Parts of New Guinea and the larger islands of Melanesia can well be left for the present, others require immediate investigation, as do all the smaller islands. "There is probably no part of the world where a larger amount of valuable material can be saved during the next few years than in Melanesia, and yet at the present moment little or nothing is being done." Much work and this of great urgency remains to be accomplished in Australia. "A thorough survey of Polynesia will yet provide material of the utmost value to the ethnologist." "In Micronesia the conditions are more satisfactory . . . but there still remain . . . islands, such as the Gilbert and Ellice Groups, about which our existing knowledge is trivial." He concludes by saying:

"Two regions, southern Africa and Oceania, combine an extreme degree of the urgency of their needs with very inadequate attempts to meet those needs. Of these regions it is suggested that Oceania should have the preference. It includes places where interesting and important examples of human culture are on the verge of extinction and other places which are in a condition especially suited for intensive work, so that a large mass of valuable material can be obtained with relative ease. Through its insular character Oceania presents conditions of especial importance in the study of certain theoretical problems, and it has a special interest in that its culture stands in close relation to that of the American continents. It is suggested that the study of a region allied in culture to that of America may react on the study of American ethnology, and may prove the best means of reaching positive conclusions concerning the exact nature of the indigenous culture of America."

Prof. Jenks gives a brief account of the subject-matter and present status of anthropology. In a section entitled "Research problems and opportunities in Anthropology," he deals solely with the Indo-Pacific and American areas. For the former he takes as his main theme the problem of the origin and spread of the Pacific islanders and their culture, and remarks that "Churchill recently has largely solved the Polynesia migration problem in the Pacific Ocean." He suggests that in Polynesia "a true knowledge of the genesis of the speech of man" possibly may be discovered, and quotes from Churchill that the Polynesian languages are of "the most elemental character," and the "parts of speech have but just begun to make their appearance." Churchill even says positively that "we find ourselves engaged with a language family in which we can discover the beginnings of human speech." These statements are very remarkable if it be true, as other linguists assert, that the Melanesian variants of the Austronesian languages exhibit more primitive features than the Polynesian (Codrington definitely states that the Polynesian group of languages is "late, simplified, and decayed" as compared with

the Melanesian), and if we are to look for the "primeval home" of the Polynesians in the Ganges Valley. One would like to have the evidence for Churchill's statement that "the Tongafiti migration has left absolutely no trace of its passage in Melanesia." Prof. Jenks refers to certain problems, such as the decay and loss of culture forms, and to prehistoric stone remains, and he recommends further excavations at Trinil for *Pithecanthropus erectus*, and a study of the individual and communal life of the orang-utan.

The antiquity and origin of man in America, and the origin and spread of aboriginal American culture are put forward as special questions requiring to be decided. The solution of the problem of the "extra-American origin of culture . . . would contribute not only to the present subject, but to the anthropological world-problem of culture similarities—whether similar cultural expressions in isolated areas had a common origin, or independent origins, or are due to transmission." Three of the most important modern anthropological problems of the Western hemisphere and the Pacific islands, of which Prof. Jenks advocates the study, are ethnic heredity, influence of environment on mankind, and human amalgamation, and he proposes that a permanent laboratory should be established eventually in connection with these studies.

Mr. Sylvanus G. Morley makes a strong appeal in his beautifully illustrated essay for a prolonged and thorough investigation of the great group of ruins at Chichen Itza in northern Yucatan. It is his belief "that no other archaeological field in the New World offers such rich promise as the region occupied by the ancient Maya, and, at the same time, no equally important field has been so inadequately studied."

The facts and arguments adduced by Dr. Rivers and Prof. Jenks point clearly to Oceania as being probably that part of the world which most urgently needs ethnographical investigation, and if the Carnegie Institution could see its way to organise a commission for the intensive study of as many portions of that area as possible, combined with an investigation of the more general problems of racial and cultural movements, it would confer an incalculable boon on all present and future students of the history of human culture. If this be not attempted very soon the opportunity will pass away for ever.

A. C. HADDON.

THE PRINCIPLE OF RELATIVITY.¹

II.

AT the root of what are generally thought of as our intuitive notions of space and time lies the conception of simultaneous instants at different points. The sensations by which we actually perceive bodies are, strictly speaking, not distributed through space; but the mental picture which we construct of the phenomena is ordered under the categories of time and space, and in

¹ Continued from p. 379.

this way of ordering the idea of simultaneous events at different places is essential.

Now the very first thing that appears, if we accept the hypothesis of relativity, is that it is impossible for us to determine uniquely whether two events are or are not simultaneous. This can be best illustrated by a simple ideal experiment. Retaining for the present the conception of a unique stationary æther, let us suppose that two points A, B, are moving relative to it with the same velocity v , and let c be the velocity of light. Now imagine a ray of light to be sent out from A at an instant t_1 , in the direction A B. Let this ray arrive at B at the instant t_2 . Let it then be reflected back to A, arriving there at the instant t_3 . Now if the distance A B is l , since the relative velocity of the light on the outward journey is $(c-v)$, we have

$$t_2 - t_1 = l / (c - v),$$

and similarly since the relative velocity on the return is $(c+v)$,

$$t_3 - t_2 = l / (c + v).$$

From these equations we obtain

$$t_2 = t_1 + t_3 / 2 + lv / (c^2 - v^2).$$

Now if the velocity v were zero, we should have the result that the moment of reflection at B is simultaneous with the moment $\frac{1}{2}(t_1 + t_3)$, that is, with the moment at A midway between those of emission and return of the ray. But if the velocity v is unknown, which is the hypothesis with which we are dealing, then we cannot say from this experiment what instant at A is simultaneous with the instant t_2 at B.

Now no man of science should say, of course, that because he does not know, or cannot determine a thing, that, therefore, it does not exist. We have no right to say that, because we cannot determine our velocity relative to the æther that therefore the æther *cannot* exist. So we do not say that the conception of "simultaneity" is an absurdity; what we do say is that the notion is not an intuitive one, forced upon us with a unique significance apart from all material phenomena; but that it is a convenient element in our ways of thinking about phenomena, and is really inseparable from the whole body of thought about them, that is, from the laws by which we conveniently describe their sequences.

In the light of the simple experiment described above, therefore, we find that the conception of "simultaneity" does not become definite until we have assigned a definite velocity to a certain point, which may conveniently be our own point of observation.

The next thing we may notice is that the notion of the "length of a body" becomes indefinite along with the term "simultaneous." For in our usual ways of thinking, the length of a body is the same as, is in fact defined to be, the distance between two points of our universal frame of reference, with which the ends of the body "simultaneously coincide." Until we have made the last phrase definite, the length of a body is either indefinite, or else it must be defined in some

other way, in which case we might have a contradiction between the definition of length and the derived concept of measurable space.

In the light of these difficulties we may be prepared to reconsider our preconceived notions of the measures of space and time and what is implied in respect of them by the laws which we find to be the best expression of the order which we have disentangled from the complex of physical phenomena, including among those laws the principle of relativity.

As was stated at the beginning, this includes the statement that it is impossible for an observer to detect a difference between the velocities of light in different directions, whatever may be his own motion. In other words, the propagation of light through space is supposed to be expressible as a uniform propagation in all directions with velocity c whatever velocity the observer supposes himself to have. This is a self-contradictory assumption if we adhere to the space and time which we use in Newtonian dynamics, where the relative velocity of two points is just their difference. But if we grant that our measures of space and time are, as has been suggested above, modes of thought inseparable from the laws into which they enter, then we realise that what we have been in the habit of looking upon as assured and permanent elements in our thought may, with the development of our knowledge of the physical world, come to require modification.

If now we start from the fundamental law that there is a definite physically-determined velocity, that of light, an invariant element in the physical world, we can proceed by an algebraic process to examine what variety is possible in the quantities by which we measure space and time. This is a problem capable of complete solution, and when it is carried out we find that there is a large degree of arbitrariness. It appears that out of all the possible systems of measurement so obtained we can always find one such that all points at rest in this system have an arbitrary uniform velocity in any other given system. If this velocity is v and if two simultaneous events as estimated in the time variable of the first system occur at two points at distance l apart on a line parallel to v , then as estimated in the second space-time system, they occur at instants separated by a time $lv / c(c^2 - v^2)^{\frac{1}{2}}$, at points the distance apart of which is $cl / (c^2 - v^2)^{\frac{1}{2}}$.

The remarkable thing is that when we have developed this infinite number of ways of measuring space and time out of the single hypothesis of the universal value of the velocity of light, we are able to show further that the whole set of laws of the electromagnetic field may be retained in the same form whichever of the systems of measurement we adopt. Thus we find that not only space and time, but the physical quantities, electric and magnetic intensity, and the force on a charged body, are quantities which are "relative," that is, which are only uniquely defined after the choice of the system of reference has been made; that is, after we have stated in ad-

vance what velocity we assign to some one particular point of the moving bodies.

It appears too that the acceleration of a moving point has a relative magnitude, and so we find that the ratio of the force on a small charged body to the acceleration produced in it, is also a quantity which depends on the particular frame of reference used; the directions of the force and the acceleration cannot even be taken to be the same in all systems of measurement; that is, the acceptance of our fundamental hypothesis makes it impossible to maintain the Newtonian conception of "constant mass." The modifications required in the dynamical laws are, however, borne out by the results of the well-known experiments on the variable inertia of the negative electrons which constitute the cathode rays and the β rays, particles the velocities of which are so great that the deviation from the ordinary laws are considerable.

A more important question even than that of the mass of the electron is that as to whether this modification in dynamical laws is allowable in the light of the enormous mass of support which the older theory receives from its agreement with the facts of planetary motion. All that can be said here is that with the modified conception of mass, and a modification of the law of gravitation which attributes to it the velocity of light and a deviation from the inverse square rule of such a kind as to make it consistent with the relativity of forces, de Sitter has shown that there is complete accord between existing observations and the demands of the hypothesis of relativity.

The Aether.

It was emphasised above that the stationary æther as it is commonly conceived is in reality nothing more than a mathematical frame of reference. Now we have seen that this frame of reference is not unique. Does the æther, therefore, not exist? We can certainly say that, if it exists, it is not to be identified with the frame of reference. What we want is to be able to reconcile the idea of a unique medium, which is the mechanism by which electrical effects are transmitted, with the mathematical equations which do not determine a unique frame of reference. This cannot be done except by attaching some concrete significance to the electrical magnitudes in terms of the constitution, motion, or distortion of this medium. As we at present know them, the terms "electric intensity," "magnetic force," "motion of the æther," have only a relative significance. If we contemplate an objective æther it might be possible to construct out of relative quantities depending on the motion of the æther a quantity which would have exactly the same kind of relativity as the electric intensity for example; that is, the electric intensity might be put into unique definition in terms of the æther, though both are only expressed relatively in terms of the frame of reference.

The principle of relativity then does not deny the existence of an æthereal medium; that is only the interpretation of an individual. What it does do is to emphasise the insufficiency of the existing conceptions of the æther, and to set up a criterion by means of which suggestions as to the nature of the æther may be examined.

E. CUNNINGHAM.

PROF. HUGO KRONECKER, FOR.MEM.R.S.

ON Saturday, June 6, Hugo Kronecker, one of the first rank of living physiologists, died suddenly of apoplexy. Although he was seventy-five years of age, his intellect was as keen, his energy as great, and his unselfishness as unbounded as at any time in his life. This is saying much, for these characters had been his in no ordinary measure. His life's work consisted chiefly of investigations into the contractility of muscle, the movements of the heart, and the effect upon it of rarefied air. He discovered almost simultaneously with Marey the curious fact that during one period of its cycle the ventricle will not respond to stimuli. To this time Marey gave the name of refractory period. He found also that there is a point generally known as Kronecker's point in the heart, puncture of which causes the heart to stop at once and permanently. His investigations on the effect of rarefied air upon the circulation convinced him that the ascent even to considerable altitudes if unaccompanied by muscular strain is without danger, and on his report to this effect the building of the well-known Jungfrau Tunnel was begun and is now nearly completed.

Kronecker was at one time private assistant to the great physician, L. Traube, and thus possessed a knowledge of medicine quite unusual amongst mere physiologists. He was one of C. Ludwig's most esteemed pupils and dearest friends, and was at one time his assistant. At Leipzig and elsewhere he became acquainted with almost every physiologist of note, and his linguistic powers, his extensive knowledge of an encyclopædic character, his geniality, kindness, and trustworthiness converted every acquaintance he made into a friend.

Like Ludwig, Kronecker published a great deal of his work under the names of his pupils, amongst whom may be mentioned Dr. Gustav Hamel, father of the aeronaut, whose untimely death the world has recently had to deplore, and Prof. Meltzer, of the Rockefeller Institute. His influence in stimulating others was enormous, and as director of the Marey Institute in Paris, as professor in Berne, and as an actual participator in most of the physiological congresses, he put at the service of everyone who was willing to work his knowledge, his time, and his energy without stint.

The esteem in which Kronecker was held is shown by the Universities of Glasgow, Aberdeen, St. Andrews, and Edinburgh having conferred upon him the degree of LL.D., and Cambridge that of D.Sc. The number of distinctions conferred upon him by foreign universities and learned bodies is

too great to mention. He served during the campaign of 1866 and the war of 1870-71, and obtained the decoration of the iron cross. His death is a great loss to physiology, and will be felt as a personal sorrow by physiologists throughout the world.

LAUDER BRUNTON.

NOTES.

WE regret to announce the death on June 6, at seventy-eight years of age, of Prof. Adolph Lieben, emeritus professor of general and pharmaceutical chemistry in the University of Vienna, and foreign member of the Chemical Society.

THE death is announced, in his seventy-first year, of Dr. Barclay V. Head, correspondant of the Institute of France, corresponding member of the Royal Prussian Academy of Sciences, and keeper of the Department of Coins and Medals at the British Museum in 1893-1906.

PORTSMOUTH has been selected as the place of meeting for the autumn conference of the Institute of Metals. The conference, which will be presided over by the president, Sir Henry J. Oram, K.C.B., F.R.S., will be held on Thursday, September 10, and Friday, September 11, in the Municipal College, a number of important papers being read each morning.

THE annual June conversazione of the Royal Society was held at Burlington House on Tuesday. Most of the exhibits of apparatus and specimens were the same as were shown at the May conversazione, of which an account was given in NATURE of May 21 (p. 304), and others have been described in our reports of the proceedings of societies and academies, so that no further reference need be made to them here.

THE Aero Club of America has appointed a committee of seventy, with Admiral Peary as its chairman, to supervise the preparation of a map of the permanent air currents over the United States. The committee will begin by formulating rules for making aerial observations at points to be agreed upon in various parts of the country. Local aero clubs will then make the observations by means of balloons and aeroplane flights. The committee will also prepare a topographical map indicating convenient landing places for airmen.

A SERIES of severe thunderstorms passed over the southern area of the metropolis on Sunday afternoon, June 14. The lightning was exceptionally severe and prolonged, and torrents of rain fell with much hail at times. Six persons, of whom four were children, were killed at about one o'clock, whilst sheltered under two different trees on Wandsworth Common, and several persons were injured, one of whom has since died. Many buildings were struck by lightning, and immense damage was sustained by flooding due to the heavy rain. The damage was almost wholly limited to an area stretching from east to west, from Blackheath and Lewisham through Streatham and Wandsworth to Wimbledon and Kingston. At Streatham Hill thunder was first heard at 12.30 p.m., and the

storms continued with more or less intensity until after 5 p.m. There were four distinct disturbances moving from east to west, and apparently subsidiary to the low-pressure area over France and Germany. The heaviest downpour of rain and hail occurred at Streatham Hill for a quarter of an hour, from 1.30 p.m.; at 2 p.m. the rainfall measured 1.10 in., at 4 p.m. an additional 0.45 in., and at 6 p.m. 0.05 in., giving an aggregate 1.60 in. At Wandsworth Common the rainfall by 3 p.m. measured 1.23 in., and at 4.30 p.m. an additional 0.65 in. was measured, giving an aggregate 1.88 in. At Kew the rainfall was 1.34 in., at Greenwich 0.32 in., South Kensington 0.23 in., Westminster 0.16 in., Camden Square, 0.04 in., at Hampstead nil.

THE address upon the relation of science to the modern State, and the inadequate encouragement given to the scientific discoverer, delivered by Sir Ronald Ross at the annual meeting of the British Science Guild on May 22 has produced a valuable and interesting correspondence in the *Morning Post* during the past few weeks. Sir Ronald Ross's main thesis was that however good the educational and laboratory opportunities may be, discoveries are not likely to be made so frequently if they impoverish the workers, or at least confer no benefits upon them, as is the case in Great Britain at present. He also pointed to the injustice of the treatment of scientific men by the State in accepting great services with little or no compensation, whereas for far less valuable services from other professional men high fees are paid. Readers of NATURE know how persistently the claims of scientific investigation to adequate recognition have been urged in these columns, and that an article upon the subject appeared in our issue of June 4. The letters published in the *Morning Post*, most of them by well-known men of science, should be the means of making a large section of the general public acquainted with the poor prospects, measured by monetary standards or worldly success, offered by a career devoted to scientific research in comparison with those of professions which do not demand exceptional qualities of originality and genius. The State may not be able to select and endow a race of discoverers, and it cannot assess the ultimate value of a discovery, but what it can and should do is to see that the men and women who are contributing to the advancement of knowledge are given the most generous encouragement and the fullest opportunities of carrying on their work.

AMONGST the terrible loss of life in the *Empress of Ireland* disaster in the St. Lawrence River recently there comes as a shock to all geologists and mining men interested in the occurrence of ore-deposits in the Archæan crystalline rocks of Canada the loss of one who, for the past thirty years, took a most active part in the deciphering of the structure of the earth's crust in the great crystalline areas of North America. In Dr. Barlow, Canada had the last court of appeal on the genesis of its ore-deposits. Trained first at home in Montreal, Barlow studied at McGill University under Sir William Dawson, Dr. Harrington, and other geologists, and was asked to join the

technical staff of the Geological Survey in 1883 at Ottawa, under Dr. A. R. C. Selwyn. Filled with energy and enthusiasm for the science of geology, he entered the field in the province of Quebec, and later on worked hard at the nickel- and copper-bearing deposits of the Sudbury region in Ontario. In the Cobalt silver-mining areas of Ontario, throughout the Lake Timiskaming areas of crystalline rocks, in the iron-ore region of Lake Timagami, as well as in the gold-bearing areas of the Porcupine district on the Montreal River, and in the Haliburton and Bancroft region of southern Ontario, throughout the Hastings series, besides the special district of Dungannon, where corundum deposits are found, Dr. Barlow was the worker who, with unceasing energy and devotion to the solution of the difficult problems presented in these various fields, characterising nearly as many petrographical provinces, has left a record of noteworthy achievement to the science. At the March (1914) meeting of the Canadian Mining Institute, held in Montreal, he was the retiring president, and he did much for the institute and the mining fraternity to bring about close relations between the thorough-going geologist and the practical mining engineer.

THE archæological section of the Victoria Museum, Ottawa, the national museum of Canada, contains a valuable collection from the Thompson River region in the southern interior of British Columbia. In 1897, with the aid of funds contributed by Mr. Morris K. Jesup, of New York, Mr. Harlan I. Smith was enabled to make important discoveries in this little known region. The material thus obtained, which is of considerable anthropological value, has now been catalogued and described by Mr. Smith in Memoir No. 1290 of the Geological Survey of Canada. The catalogue is provided with a good series of illustrations, and is an important contribution to the ethnology of North America.

DR. ASHBY, Director of the British School at Rome, has recently delivered a lecture before the Malta Historical and Scientific Society on recent discoveries in the island. A large Roman villa has now been thoroughly examined, which shows rooms grouped round a central peristyle, with fluted columns of Malta stone, and an underground water channel leading from the great cistern of Medewiet, which was excavated in 1881. The problem of the connection of the two has not, however, been determined. Opposite the villa is the Ghar Dalam cave, the exploration of which has been resumed. On the upper layer of earth pottery, both prehistoric and Punic, was discovered, mixed with the smaller bones of hippopotami and other animals, showing that the stratification had been destroyed probably by the percolation of water through the cave, which is not very far below the surface, and is even now full of moisture. These animals lived in the island while it formed part of a larger continent, and their bones were probably washed into the cave in their present state of disorder when the continent was submerged.

MR. J. P. BUSHE-FOX reported at the last meeting of the Society of Antiquaries the results of

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excavations at Hengistbury Head, lying east of Bournemouth, and forming the south side of Christchurch Harbour. The place was occupied from Neolithic times, and interments supplied Bronze age pottery, an incense cup, gold, amber, and bronze articles. In England it had hitherto been extremely difficult to fill in the gap between the end of the Bronze age and the period immediately preceding the Roman occupation; but the discovery at Hengistbury Head of a complete series of pottery linking up with the Hallstatt and La Tène periods is of great value. Perhaps the most interesting discovery was of more than 4000 gold, silver, and bronze coins, most of them British, and a large number of new types. The coinage of Gaul and Britain was largely copied from Greek originals, principally a coin of Philip of Macedon, about the middle of the fourth century B.C. The head and chariot on this coin had become so degraded by copying that the original pattern had been entirely forgotten. Most of the Hengistbury coins belong to the last stage of this type, and many of them are covered with little more than dots and lines. With them were associated Roman coins dating as late as the middle of the second century A.D. As many of the British examples were in mint condition, this part of the country had evidently been little affected by the Roman occupation of more than a century before.

MR. CLARENCE B. MOORE records in vol. xvi. of the Journal of the Academy of Natural Sciences of Philadelphia, 1913, under the title of "Some Aboriginal Sites in Louisiana and in Arkansas," the results of his archæological investigations of 1912-13. He covered ground previously unexplored by archæologists, but unfortunately the finds were very meagre and on the whole uninteresting, partly because the area in question is subject to floodings, and therefore the destruction or the impairment of mounds is not permissible. Nevertheless, the district had to be investigated in order to complete the scheme which Mr. Moore has imposed on himself, despite the fact that he knew he would be unlikely to get many specimens. It is this attitude of mind, the patient accumulation of data irrespective of their intrinsic worth and disregard of sensational results, that gives Mr. Moore a distinguished place among archæologists. Many of the mounds are quadrangular, with the sides facing the cardinal points, frequently they are about 15-20 ft. in height, and have a square flat summit, sometimes 100 ft. or more in diameter. In addition to the usual wealth of excellent figures of pottery, etc., there are two coloured plates, one of a large effigy-pipe of earthenware, the other of irregular earthenware objects of unknown significance. Those that are biconical may have been used in the "hand-game," a gambling game universally spread over North America, possibly some of the other objects may have been used for similar purposes; at present they remain a mystery. The memoir closes with a short report on a collection of crania and bones by Dr. A. Hrdlička. The skulls were slightly deformed artificially, and "are remarkably like the less narrow type of crania among the Siouan people and the more southern Iroquois."

THE Milk and Dairies Bill passed the second reading on June 9. On the whole a favourable opinion was expressed with regard to it, though Mr. Astor thought there was a real fear that it might seriously diminish the quantity of milk available, and so tend to increase its price. He also urged the grading of milk.

THE annual report of the superintendent of the Brown Institution (Mr. F. W. Twort) has been issued. Some 6000 animals were brought to the institution, of which 565 were treated as in-patients. In addition to its hospital, important research work is carried out in the laboratories of the institution—investigations on John's disease of cattle, by Dr. C. Twort; the functions of the thyroid gland, by Mr. Edmunds; infantile diarrhoea, by Dr. Mellanby and the superintendent, etc.

As is well known, those engaged in occupations in which much siliceous dust is produced (*e.g.* potters, certain miners, etc.) suffer from a form of lung disease. Dr. McCrae has analysed the lungs from such cases occurring in the Witwatersrand mines, South Africa. He finds that from 2.8 to 9.6 grams of silica may be present, compared with 0.55 gram in a normal lung. Microscopical examination of the siliceous particles showed them to be angular, and the majority have a diameter of less than $1\ \mu$ (South African Institute for Medical Research, 1913).

We have received from the publisher, Mr. Gustav Fischer, Jena, "Studien zur Pathologie der Entwicklung" (Band i., Heft 3, 1914), edited by Profs. R. Meyer and E. Schwalbe. The principal contribution is by Dr. L. Kech on the morphology of the musculature of the human extremities when defective (pp. 428–539), containing a summary of published examples. Abstracts of papers published elsewhere, as well as original communications, are included in the volume, which should be of considerable service to those engaged in this branch of research.

A REPORT of the work of the Radium Institute for the year 1913, by the director, Mr. Hayward Pinch, has been issued. In all, 860 cases have been treated, of which about half were cases of cancer. A number of the latter improved more or less, but it is too early yet to determine whether they be cured or not. It would seem that in cases of cancers of the skin the outlook is very hopeful, but that in tumours of the tongue and mouth it is less hopeful—though the method of burying the radium tube in the tumour has been successful in some cases. Tumours of the womb yield gratifying results, of the breast fair results. Intestinal tumours, though difficult to reach, do well in a relatively small number of cases. Tumours of bone, if taken early, do well. In most cases pain and irritation are relieved. Besides the direct application of radium in the institute, tubes of radium emanation and radio-active water are supplied for use outside.

In his report for 1913 the curator states that the Sarawak Museum has made steady progress, the number of additions during that year being above the average, and articles based on the collections more

numerous than usual. The crying need of the moment seems to be the expansion and (when necessary) description of the large collection of Bornean beetles.

WITH its June issue the *Entomologist's Monthly Magazine* celebrates its jubilee, the first number, under the editorship of Messrs. Stainton, McLachlan, Rye, Blackburn, and Knaggs, having appeared in June, 1864. Of the contributors to the first volume, eight well-known entomologists—Messrs. A. G. Butler, F. Enoch, C. Fenn, G. Lewis, G. B. Longstaff, G. F. Mathew, D. Sharp, and G. O. Waterhouse are still with us to testify to the healthfulness of "butterfly-hunting." Since its commencement, the magazine has added no fewer than 2992 species to the British fauna.

LICE (Anoplura) and biting-lice (Mallophaga) infesting mammals form the subject of an article in the May issue of the *American Naturalist* by Prof. V. L. Kellogg, of Stanford University, Colorado. In a previous communication on the Mallophaga of birds it has been shown that the evidence of these parasites frequently confirms that of other factors in respect to the near affinity between hosts that are widely sundered geographically. Similar evidence is afforded by the study of the mammal-infesting types, the author remarking that, in spite of the incompleteness of our knowledge, "it is surprising how repeatedly the commonness of parasite species to two or more related, although geographically well separated, host-species is illustrated. All through the order (*i.e.*, class) from Marsupials to Quadrumana this condition is again and again exemplified."

As the result of collecting trips in the Middle and Far East, followed by technical work in the chief museums of Europe. Mr. C. W. Beebe has evolved a scheme of classification of the pheasants and their relations, based on the order in which the tail-feathers are moulted, a feature he believes to afford the most trustworthy indication of genetic affinity. In this he is in agreement with the work of Dr. Bureau on the tail-moult in partridges, although he was unacquainted with those researches until his own were nearly completed. On this basis Mr. Beebe (whose article appeared in the April issue, vol. i., No. 15, of *Zoologica*) divides the pheasant family (Phasianidæ) into four sub-families. In the first of these (Perdicinæ) the tail-moult commences with the inner pair of feathers, while in the second (Phasianinæ) the outermost pair are the first to be shed; in the other two sub-families an intermediate condition exists.

A NEW method for determining the densities of minerals and rocks at high temperatures is described by A. L. Day, R. B. Sosman, and J. C. Hostetter, in the *American Journal of Science*, vol. xxxvii. (1914), p. 1. The substance is held down by weights under an inverted crucible of graphite, which is immersed in a bath of molten tin or silver. Tin has the conveniently low melting point of 232° . The measurements are made by noting the weight required to pull down the crucible and the assay to a given depth marked on a stem connected with the crucible. The graphite is protected from oxidation by an atmosphere

of nitrogen and carbon monoxide. The density-curve of the metal used and the expansion-coefficient of graphite are, of course, factors in the calculation of the results. One of the most interesting of these is that as the temperature (575°) at which α -quartz passes into β -quartz is approached, a striking increase occurs in the rate of expansion.

THE area of German East Africa to the south-east of the Victoria Nyanza and south of the frontier of British East Africa was explored in 1906-7 by Prof. Fritz Jaeger, Professor of Colonial Geography in Berlin, and his report on the Riesenkrater Highlands includes a detailed account of the interesting area which he investigated. It has been issued in the *Mitteilungen aus den Deutschen Schutzgebieten, Erganzungsheft*, No. 8 (1913, 4to, 213 pp., 12 pl., 3 maps). The most interesting general problem in the area is the course across it of the Great Rift Valley of East Africa. The western wall of this valley continues southward, forming the western scarps above lakes Magadi, Manyara, and Balangda; but the eastern wall disappears in a wide volcanic belt which extends westward from the extinct volcanoes of Kilima Njaro, and Meru. In the same district a series of faults branches off from the western wall of the Great Rift Valley and trends south-westward; these faults give rise to a series of rift valleys of which the largest includes the plains of Wembere and Lake Njarasa; a smaller one, Prof. Jaeger has called the Hohenlohe-Graben. These valleys may be really off-branches, and the main valley probably continues southward; its eastern wall may be represented by some faults, with a throw of more than 600 ft., which lie along the southern extension of the eastern side of Lake Manyara. The memoir includes a detailed account of the volcanic highlands to the north and west of Lake Manyara, which Prof. Jaeger has called the Riesenkrater Hochland.

R. E. LIESEGANG's suggestions and experiments as to the osmotic deposition of concentric coats in chemical and mineral aggregates have received considerable attention among geologists, and notably from Mr. G. Abbott (*NATURE*, vol. xcii., pp. 607 and 687). Mr. Abbott has now published in the *Pioneer* (March 20 and 27, 1914) a further study of the discoid limestones which simulate organic characters in the concretionary beds of Permian age at Sunderland, and suggests that we must not ignore processes of mineral growth "even in the evolution of well-known organisms, such as corals." We must not, he urges, "remain blind to what the alkaline earths *can* of themselves do in the formation of the skeletons of higher structures, in the roll of living things." Mr. E. A. Martin, Hon. Curator of the Museum of the Borough of Croydon, South Norwood, writes to us on the same subject, pointing out that the secretion of carbonate of lime or silica by marine organisms may be "immensely assisted by the osmotic action which Mr. Abbott believes to have been the cause of the discoid and coralloid growths of the limestones of Fulwell Hill." "Has this, too," he asks, "anything to do with the reason why some

shells are spiral, discoidal, bivalve, and so on?" Here the question appears to be one for the zoologist, who may be able to indicate a cause in the grouping of the soft parts of the animal, by which the external skeleton is controlled.

A FIRST communication on the motion of the air in the lowest strata of the atmosphere, by Prof. G. Hellmann, appeared in the *Sitzungsberichte* of the Prussian Academy of Sciences of April 2. As pointed out by the author, of all the meteorological elements determined by instruments, none lacks comparability between one place and another like wind velocity. This is due to some extent to instrumental defects, but more particularly to the extraordinary differences of exposure, especially height above the ground. Experiments are being carefully made by the Berlin Meteorological Institute at heights of 2, 16, and 32 metres, the results of which show an annual mean increase in velocity of 48 per cent. between 2 and 16 metres, but only 14 per cent. between 16 and 32 metres; it is proposed to erect additional instruments at greater heights. Little variations in the increase of velocity with height were found to exist during the monthly periods, except at the lowest level, owing to friction with the surface. Some very interesting and unexpected results are referred to with respect to the completely opposite behaviour of the daily range of velocity in light and strong winds. The systematic study of the vertical wind components, such as those now in question, is of great importance at the present time.

IN the May number of the Proceedings of the American Academy, Dr. Louis Bell gives an account of an investigation of the types of abnormal colour vision he has commenced with the aid of the Rumford Fund. His spectroscopic apparatus allows him to classify his cases very rapidly. It depends on matching a synthetic yellow and a synthetic blue-green, which lie at the points of intersection of the red-green and the blue-green sensation curves for the normal eye, by a pure spectrum which occupies the lower, while the synthetic colour occupies the upper half of the field of view. Of the twenty-six types of abnormality, Dr. Bell has already investigated the six possible types characterised by deficiency or excess of sensitivity to one of the three fundamental colours, five of the twelve possible cases in which two of the fundamental sensations are affected, and four of the eight possible cases in which three of the sensations are abnormal. He points out that the direction in which we must look for remedial measures is that of reducing the stronger sensation or sensations by means of coloured spectacles till the three are in the normal ratio. This can only be done in the deficiency cases at the expense of the general luminosity.

PART 3 of vol. iii. of the Science Reports of the University of Sendai, Japan, contains two important magnetic papers. The first, by Messrs. K. Honda and Y. Ogura, deals with the relation between the changes with temperature of the electrical resistances and the magnetic susceptibilities of iron, steel, and nickel. The materials were tested in the form of wires about a metre long and a

millimetre in diameter. The magnetic field of about 160 was produced by coils, and the magnetisation measured by the magnetometer method up to temperatures of 800° or 900° C. The results show that the changes of conductivity and susceptibility occur together, and that both are due to gradual changes of the properties of one of the phases rather than to any change of phase of the constituents. The second paper, by Messrs. H. Takagi and T. Ishiwara, gives the susceptibilities of a large number of minerals and igneous, aqueous, and metamorphic rocks, tested by the non-uniform field method up to fields of 2600. In general, igneous rocks are strongly paramagnetic, and their susceptibilities decrease with the field, while the other rocks are weakly paramagnetic or diamagnetic, and their susceptibilities nearly independent of the field.

BULLETIN No. 42 of the experiment station of the Hawaiian Sugar Planters' Association contains an account by Mr. Noël Deerr of an experimental study in multiple effect evaporation. From these experiments it appears that the temperature difference in the first cell is a rough index of the rate of evaporation, and that the vapours in a multiple effect evaporator are superheated. The heat economy of quadruple effect evaporators as found in practice compared with a computation on ideal lines lay between 0.8 and 0.9, the latter figure being obtained with well protected, and the former with unprotected, or badly protected apparatus. A vertical submerged tube apparatus with 5-lb. gauge pressure in cell No. 1 (227° F.), and not less than 26.5 in. vacuum in the last cell (127° F.) should evaporate not less than 9 lb. of water per sq. ft. an hour, with juice entering at 212° F., and should evaporate 4.2 lb. of water per lb. of steam. If these results are not realised, foul heating surfaces, too slow evacuation of condensed waters, or incondensable gases may be looked for. A horizontal tube film evaporator had a much greater rate of evaporation than vertical submerged tube evaporators.

THE recent pronouncement of Sir Percy Scott that the importance of submarines has not been fully recognised, and that it has not been realised how completely their advent has revolutionised naval warfare forms the subject of articles in *Engineering* and the *Engineer* for June 12. Sir Percy has said that, in his opinion, as the motor vehicle has driven the horse from the road, so has the submarine driven the battleship from the sea. These statements have encountered a good deal of criticism, and neither of our contemporaries advocates the interpretation that we should discontinue the building of battleships. It cannot be said that Sir Percy has adduced convincing reasons for the complete change in naval policy which he advocates. It has not been established that the torpedo, practically the only weapon of the submarine boat, would be effective. Again, the radius of action of such boats when submerged is very limited, not much more than one hundred miles, so that in taking a considerable voyage they would have to proceed "awash," and would then be subject to attack by torpedo-boat destroyers and other surface craft, and by aerial vessels.

MEMBERS of the British Association about to proceed to Australia for the meeting in August next, and students of geography generally, should examine the large scale map of Australia just published by Messrs. G. W. Bacon and Co., Ltd. The size of the map is 72 in. by 56 in., and it can be had in four sheets, mounted to fold in neat cloth case for the bookshelf, at the price of 25s. The map is constructed on Clarke's Perspective Projection, and the scale is 1 : 2,500,000, or 39.5 miles to the inch. Rivers, lakes, and similar physical features, are shown and named in blue, while black type is used for place-names, mountains, and so on. Roads, tracks, and telegraph lines are marked in red. Inset maps on the same scale are provided of Tasmania and Papua. The map is also published mounted on cloth with rollers, in which form it will prove very useful in the office and study.

MR. S. J. BARNETT writes from the Ohio State University, U.S.A., to say that the word "size" in the penultimate line of the second column of p. 109 of the current volume of NATURE, on which a letter from him is printed, should be "sign." We have examined Mr. Barnett's original MS., and in view of the indistinct character of the handwriting understand how the misprint occurred.

OUR ASTRONOMICAL COLUMN.

THE NEW ZEALAND SOLAR OBSERVATORY.—In an address to the members of the Wellington Philosophical Society, by the president, Dr. C. Monro Hector, the subject dealt with was the present state of affairs as regards the Cawthron Solar Observatory. Referring first of all to the approval of all the leading authorities in both Europe and America for the establishment of such an observatory, he points out the suitability of the neighbourhood of Nelson as the site. The records show that this region has 20 per cent. more sunshine and 33 per cent. less rain than at the Kodaikanal Observatory in India. Several excellent sites about Nelson are available, but that on the Port Hills, within easy reach of the town, has so far proved the best from an observational point of view; if this be eventually selected, it will be a means of saving much money in initial outlay and running expenses. Mr. Thomas Cawthron has promised the 50,000l. for a beginning, being the estimated minimum for establishing the observatory on a continuous and permanent basis; a suggested deed of trust has been drawn up, and a suggested board of trustees has been submitted to him and approved. The proposed constitution of the board is as follows:—Mr. Thomas Cawthron, one member nominated by each of eight institutions, the Government Astronomer, and two others elected by the rest of the board.

THE POSITIONS OF VARIABLES AND ASTEROIDS DISCOVERED AT THE LOWELL OBSERVATORY.—Bulletin No. 61 of the Lowell Observatory contains a communication by Mr. C. O. Lampland with reference to the positions of variables and asteroids discovered on photographs of star fields taken with the 40-in. reflector of the Lowell Observatory. During the past year about 800 negatives have been made and examined, and measures were made with a Zeiss comparator equipped with a Blink Mikroskop. All the areas were photographed in duplicate, and the exposures were from two to three days apart on the average. The settings at the telescope were made on

the intersections of the hour-circles and parallels of declination (at intervals of four minutes in R.A. and 1° in declination) in Schönfelds and Gould's *Durchmusterung* charts, so the plates (7×5 in.) in their longest direction have considerable overlap, the linear scale of the negatives corresponding to one degree of arc being 3.8 in. Mr. E. C. Slipher was a co-worker at the telescope, and with the examination of the negatives, but Mr. Lampland is responsible for the magnitudes and determinations of position which accompany the paper in the form of tables. Nearly all the objects dealt with are of magnitude about 12 or fainter.

RADIAL VELOCITIES OF 100 STARS WITH MEASURED PARALLAXES.—Messrs. W. S. Adams and Arnold Kohlschütter contribute a valuable paper to the May number of the *Astrophysical Journal* (Contributions from the Mount Wilson Solar Observatory, No. 79) relative to the radial velocity determinations during the past three years of stars fainter than magnitude 5.5 on the visual scale for which observations of parallax are available. The photographs were secured with the 60-in. reflector in conjunction with the Cassegrain spectrograph adapted for use with one prism, but for stars from 5.5 to 6.5 magnitude a camera lens (Brashear special triplet) of 102 cm. focal length was used, while for stars fainter than 6.5 a lens (Cooke astrographic type) of 46 cm. focal length was employed. Briefly summarising some of the conclusions derived from this excellent piece of research work, the first to be mentioned is the enormous radial velocities of a few of the stars observed. Thus Lal. 1966 and Lal. 15290 indicated velocities of -325 and -242 km., the first of these being the highest recorded radial velocity among any of the stars. Four other stars exceeded 100 km., and several between 75 and 100 km. A notable fact is the great preponderance of large negative over large positive velocities, no less than 75 per cent. of the large velocities observed being negative. The following interesting table shows the stars exceeding radial velocities of 50 km. with their spectral types, showing that nearly all classes of the latter are involved:—

Positive (5)			Negative (15)		
Groom. 864	Go	+100	Lal. 1045	K1	-58
Groom. 1281	F9	84	Lal. 1966	F3	319
20 Leo. Min	G1	54	Lal. 4855	Go	103
33 Virginis	K1	56	Lal. 5761	A3 β	151
Lal. 30694	G5	+57	Lal. 15290	F7	250
			Lal. 21185	Ma	85
			Lal. 27744	G9	58
			O2 298	Ko	55
			W.B. 15h 720	G9	54
			Lal. 28607	A2 β	158
			72 ω Herculis	Go	59
			31 β Aquilæ	G7	80
			Lal. 37120-1	G2	143
			Lac. 8381	K6	50
			Pi 23h 164	F8	-59

It will be noticed that the two stars with the largest proper velocities are of types F3 and F7, and the two succeeding stars are of the A type.

THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

THIS congress will be held at the Imperial Institute on June 23-30. Meetings will commence each week-day at 10.30 a.m., except on Saturday, which will be devoted to special visits. The mornings, as a rule, will be devoted to discussions, and the afternoons to papers on special subjects. Only a few of the more

important matters to be dealt with can be mentioned here, and those interested should consult the general programme, which can be obtained on application to the general secretaries at the Imperial Institute, South Kensington, S.W.

At the inaugural meeting on June 23, the president, Prof. Wyndham R. Dunstan, will receive the delegates of the foreign and colonial Governments, and will deliver the presidential address. In the afternoon he will preside at a discussion on "Technical Education in Tropical Agriculture," to which Mr. Dudgeon (Egypt), Dr. Francis Watts (West Indies), Mr. Lyne (Ceylon), Mr. McCall (Nyasaland), and others will contribute.

An interesting feature of the congress will be a series of four special papers to be given on certain afternoons. On Tuesday, June 23, Mr. J. A. Hutton, chairman of the British Cotton Growing Association, will describe the work of that association. The Earl of Derby, president of the association, will take the chair, and Lord Emmott, Under-Secretary of State for the Colonies, will speak. In the same series Sir Louis Dane will preside at a meeting on Thursday afternoon, at which Mr. Shuman will describe the "Utilisation of Sun-power for Irrigation and Other Purposes"; on Friday afternoon Prof. Wallace will lecture on "The Caracul Sheep"; and on Monday afternoon, June 29, Mr. Wigglesworth will describe "The Fibre Industry of British East Africa."

On Wednesday morning, June 24, two discussions will be held; the first, presided over by Sir Ronald Ross, will deal with "Hygiene and Sanitation on Tropical Estates," and the second, at which Sir Sydney Olivier will take the chair, will be concerned with "Legislation against Plant Diseases," to be introduced by a paper from Mr. A. G. L. Rogers, of the Board of Agriculture.

On Thursday morning the president will introduce a discussion on "The Factors which Determine Variation in the properties of Plantation Rubber, with Special Reference to its Uses for Manufacturing Purposes," to which planters, manufacturers, and others will contribute. In the afternoon Sir E. Rosling will preside, and papers on rubber will be read.

On Friday morning the first discussion will be on "Agricultural Credit Banks and Cooperative Societies," at which Sir Horace Plunkett will preside. The second will be on "The Organisation of Agricultural Departments in Relation to Research," and at this the President will take the chair.

On Monday, June 29, Viscount Kitchener will take the chair at a discussion on "The Improvement of Cotton Cultivation," at which papers will be read by Mr. Dudgeon (Egypt), Prof. Todd (Nottingham University), Mr. Arno Schmidt (International Federation of Cotton Spinners), and Mr. McCall (Nyasaland). The afternoon will be devoted to sectional meetings for papers on "Cotton" and on "Jute and Hemp Fibres."

Tuesday, June 30, will be the last day of the congress. Two sectional meetings for "Cotton" and "Miscellaneous" papers will be held in the morning, and the final meeting of the congress will be held at 3.30 p.m. in the afternoon.

His Majesty the King has graciously consented to become patron of the congress, and His Majesty's Government will give a reception for the delegates and members of the congress at the Imperial Institute on Tuesday, June 23, at 9.30 p.m. Receptions will also be given by the Royal Colonial Institute (June 24) and by the Rubber Growers' Association (June 30).

The subscription for membership, including all publications of the congress, is 1l.

OPENING OF THE NEW PHYSIOLOGICAL
LABORATORY AT CAMBRIDGE.

HONORARY DEGREES CONFERRED.

THE Public Orator (Sir John Sandys) delivered the following speeches in presenting to the Chancellor (Lord Rayleigh) the several distinguished recipients of the honorary degrees conferred on the occasion of the opening of the new physiological laboratory at Cambridge on June 9:—

Hon. LL.D.

H.R.H. PRINCE ARTHUR OF CONNAUGHT, K.G., K.T.,
G.C.V.O.

Gratias, quae Principi feliciter ad nos advecto patria in lingua feliciter redditae sunt, etiam Academico in sermone eidem libenter reddimus. Salutamus Victoriae Reginae et Principis Alberti, Cancellarii nostri, nepotem acceptissimum, Ducis Arthuri filium unicum, Principem patriae devotissimum, Principem in luce publica plurima cum laude versatum. Regis nostri in nomine olim ad extremam Orientis oram honoris causa plus quam semel missus est; Regia artium in Academia nuper pictoribus nonnullis consilia sobria, consilia sana, commendavit; nostram denique ad litterarum et scientiarum Academiam hodie allatus, aedificium novum physiologiae studiis dedicatum auspiciis optimis mox inaugurabit. Physiologiae inter leges memoratu dignum est Horatianum illud:—
"fortes creantur fortibus et bonis." Iuvat igitur Ducis fortissimi et optimi, abhinc annos undecim Doctoris nostri nominati, heredem dignissimum laurea eadem hodie coronare.

THE RIGHT HON. VISCOUNT ESHER, G.C.V.O.,
G.C.B., M.A., Trinity College.

Sequitur deinceps iudicis summi, alumni nostri, filius, vir et inter Etonenses et in Collegio nostro maximo educatus, deinde regni totius senatoribus suffragio electis per quinquennium additus, Ducis Devoniae Cancellarii nostri filio, postea Cancellario nostro, fere eodem tempore adiutor acerrimus. Nuper etiam Academiam nostram magnopere adjuvit, et aliorum in nos liberalitatem generosissimam excitavit. Viri huius ductu prospero, aureus ille donorum rivus Academiae nostrae in silvas defluxit; eiusdem auxilio, etiam in clivo quodam saluberrimo salutis templum illud nuper aedificatum est, ubi hereditatis (ut aiunt) leges professor noster novus investigabit, cuius cathedra alumni nostri magni nomine in perpetuum ornabitur, Arthuri Balfour. Ergo, in colle nobis propinquo, a professore nostro, etiam in aliis rerum naturae provinciis, Horatianum illud verum esse comprobabitur:—

est in iuvenis, est in equis patrum
virtus, neque imbellem feroces
progenerant aquilae columbam.

THE RIGHT HON. BARON MOULTON OF BANK, M.A.,
F.R.S., Honorary Fellow of St. John's, and late
Fellow of Christ's.

Adsurgit proximus Collegii Divi Ioannis alumnus, vir abhinc annos quadraginta sex in studiis mathematicis locum omnium summum adeptus, qui, Christi in Collegio socius electus, etiam iuris in provincia honorum publicorum ad culmina summa pervenit. Olim in legibus ad scientiam machinalem pertinentibus inclaruit; nuper etiam medicinae de scientia illo die praeclare meritis est, quo experimenta quaedam generis humani salutis necessaria esse luculenter comprobavit. Ergo non modo Archimedis sed etiam Aesculapii alumnus iure optimo erit acceptissimus. Ceterum haec omnia, peritis non ignota, hodie neque (ut Tullius ait) ad vivum rescanda, neque (ut mathe-

matici dicunt) ad infinitum producenda. Inter omnes constat iudicem tam conspicuum iuris doctorem hodie merito creari.

COLONEL STARLING MEUX BENSON, Master of the
Drapers' Company.

Inter societates illas Londinenses, quae divitiarum amplitudine et liberalitatis laude excellunt, una est quae propterea nostrum omnium animis identidem obversatur, quod non modo agri culturae studium inter nos magnopere adjuvit, sed etiam, munificentia hodie imprimis memorabili, aedificium novum physiologiae studiis dedicatum nobis donavit. Ut in societatem illam munificam animum nostrum gratum aliquatenus indicemus, societatis totius magistrum titulo nostro libenter decoramus, virum qui, olim inter milites spectandus, linteonem (ut aiunt) in societate liberalissima, pacis in artibus iam dudum floruit. Hodie saltem "cedant arma togae," dum militum tribunal, etiam pacis in artibus praeclarum, purpura nostra honoris causa vestimus.

Hon. Sc.D.

SIR WILLIAM OSLER, Bart., M.D., F.R.S.,
Regius Professor of Medicine, Oxford.

Caritatis vinculo triplici nobiscum est coniunctus medicus illustris, vir inter fratres nostros Canadianenses et inter consobrinos nostros transmarinos medicinam praeclare professus, et inter sororis nostrae venerabilis, sororis nostrae Oxoniensis silvas, professoris medicinae regio munere ornatus. Peritis nota sunt ea, quae, aut solus aut cum aliis consociatus, in magna voluminum serie de medicina disputavit. Pluribus loquuntur ea quae de animo aequo, de consiliis ad vitae finem perfectum spectantibus conscripsit. Nobis autem ideo potissimum dilectus est, quod medicinae, litterarum renascentium in saeculo, studiis devotissimus, inter nosmet ipsos egregie laudavit virum et de Oxoniensibus et de Cantabrigiensibus praeclare meritum, regiae medicorum societatis conditorem illum, Thomam Linacre.

SIR DAVID FERRIER, M.D., F.R.S.,
Emeritus Professor of Neuropathology,
King's College, London.

Progreditur deinceps vir inter Aberdonenses, Edinenses, Heidelbergenses olim educatus, inter Londinenses denique et "neuropathologiam" (ut aiunt) et artem medendi praeclare professus. Viri huius et collegarum eius peregre docentium experimentis didicimus, cerebri duplicis corticem non totum corporis totius motus moderari, sed partem aliam ad aliam corporis partem pertinere; cerebri in parte una videndi sensum, in alia sensum audiendi collocari. Tali autem ex scientia morborum varietates quaedam melius inter sese dignoscuntur, vitaeque humanae dolores multum minuuntur. Abhinc annos quattuor et triginta inter doctores nostros honoris causa libenter numeravimus generis humani amicum illum, Iosephum Lister: hodie vero, saeculo in novo, etiam alium generis humani amicum titulo nostro non minus libenter decoramus.

SIR EDWARD SCHÄFER, F.R.S.,
Professor of Physiology, Edinburgh.

Urbis Edinensis, Athenarum illarum Caledonicarum, Academia ad nos misit physiologiae professorem illustrem, cuius opera, ad histologiae et physiologiae scientiam pertinentia, physiologiae et medicinae studiosis iam dudum cognita sunt. Omnibus autem nota sunt experimenta illa, per quae homines in fluctibus submersi, respiratus artificiosi auxilio, ad vitam revocantur. Olim rex ipse Olympi Aesculapio

propterea invidisse dicitur, quod, Hippolyto ad vitam revocato, iura Plutonis imminuisset. Nunc autem omnibus penitus persuasum est, nihil quod hominum salutem prosit, summo Patri posse displicere. Non immerito igitur illos in honore habemus, quorum auxilio mortis imperium inter terminos artiores contractum vidimus.

MR. ERNEST HENRY STARLING, M.D., F.R.S.,

Professor of Physiology, University College, London.

Agmen nostrum claudit hodie Universitatis Londinensis in Collegio quodam illustri professor insignis. Physiologis notum est sanguinis nostri partem quandam e venis quibusdam subtilissimis per corporis telas propinquas textu tenuissimas exsudare, et corpori alimenta quaedam nova ministrare. Viri huius praesertim experimentis sudoris illius ratio universa explicata est, qui etiam vitam corporis iam mortui in corde et pulmonibus conservatam, et partium superstium motus, investigare potuit. Talium virorum ingenio, vocabulo quodam a lingua Graeca derivato, quod *hormone* dicitur, res quaedam chemica patefacta est, quae, ex alia corporis parte intima, parti alii stimulus addit, hinc illuc velut nuntia quaedam transmissa. Etiam physiologiae in studio quicquid novi aliunde ad nos advectum est, etiam nobis novos stimulus addit. Ergo etiam hunc virum, rerum exterarum nuntium ad nos advectum, decoramus, qui tot collegas suos non modo industriae et laboris sed etiam gloriae et honoris stimulus concitavit.

THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING.

THE annual report of the president of the Carnegie Foundation for the Advancement of Teaching shows a total endowment of 3,065,000*l.*, and an expenditure for the year ending September 30, 1913, of 131,686*l.* Of this 103,888*l.* were distributed in retiring allowances to professors, and 16,150*l.* in pensions to their widows. Thirty-three allowances were granted during the year, making the total in force 403, the average annual payment to an individual being 340*l.* The total distribution from the beginning has been 587,385*l.* The educational work of the foundation was separately endowed in January, 1913, by a gift of 250,000*l.* from Mr. Carnegie through the Carnegie Corporation of New York. This body, which is endowed with 25,000,000*l.* for "the advancement and diffusion of knowledge and understanding," has five ex-officio trustees, of whom one must always be the president of the Carnegie Foundation for the Advancement of Teaching.

In connection with the foundation's work as a centre of information concerning pensions, the president, Mr. H. S. Pritchett, discusses pension systems that are maintained by half a dozen colleges, the development of new systems at Brown University, the Rockefeller Institute, and the American Museum of Natural History, the new federated pension system of the English universities, and the proposed system for the clergy of the Episcopal Church. Among pensions for public-school teachers the report discusses the New York City system and the new State system in Massachusetts.

At the Rockefeller Institute for Medical Research the pensions are stipendiary in character, being three-quarters of the last annual salary to those retiring at the age of sixty-five, after fifteen years of service. Retirement is also permitted at the earlier age of sixty, after fifteen years of service, the pension in this event being one-half of the last annual salary, plus 10 per cent. for each year of service in excess of fifteen. These pensions are offered only to members

and associate members of the institute, of whom there are now twelve. The maximum for retiring allowances is high, being set at 2000*l.* The rules repeat the rule of the University of Chicago, that "the obligation to pay retiring allowances will be neither greater nor less than the obligation to pay salaries; so that if misfortune shall compel a percentage reduction of salaries, retiring allowances may be reduced in the same proportion."

Much of the report is devoted to the development of the educational work of the foundation into a separate division of educational inquiry. Its recent work includes a study of education in Vermont at the request of the Vermont Educational Commission, of legal education at the request of a committee of the American Bar Association, and of engineering education at the request of a joint committee representing the national engineering societies. Plans for the study of engineering education are now being completed.

The earlier educational work of the foundation is continued in the report by commendation of the present tendency of college entrance requirements toward both elevation and flexibility. The need for further improvement is shown by the fact that only 55 per cent. of the students now in American colleges are high-school graduates. The decrease in the number of medical schools in the country from 162 in 1910 to 115 in 1913, and the rapid improvement of the better schools are commented upon with appreciation. A general study of the problems of the State regulation of higher education is provided.

An interesting tabular statement is provided which sets out the total number of students in 807 universities and colleges in the United States, and also the number of these, who, having passed college entrance examinations and requirements, rank as collegiate students. In the 807 institutions there are in all 330,832 students, of whom 183,089 are students of college grade. In each of ten States there are upwards of 10,000 students registered in these places of higher education, and the following extract from the table shows the number of students of college standing in each case.

State	Institutions	Total number of students	Students of college grade
Illinois ...	40 ...	26886 ...	14269
New York ...	32 ...	24214 ...	19365
Pennsylvania ...	40 ...	23633 ...	13279
Ohio ...	45 ...	22704 ...	14126
Indiana ...	25 ...	14635 ...	7653
Massachusetts ...	17 ...	14341 ...	13859
Iowa ...	40 ...	13251 ...	6607
Texas ...	37 ...	12653 ...	4405
Kansas ...	26 ...	11563 ...	5654
California ...	19 ...	11376 ...	7864

There has been in the last five years a marked recrudescence of State activity with regard to higher institutions of learning. In a number of States the president of the State university has been dismissed, whether justly or unjustly, in a peremptory manner. In other States there has been legislation with respect to the differentiation of State institutions. In still others the regulation of degree-granting powers has occupied the attention of legislators. On the whole, the last five years have been distinctly marked by the activity of legislative authorities concerning the State institutions, and by the evidences of some awakening as to the need for the regulation of all higher institutions of learning. Whatever may be the immediate outcome of this movement, it is probably a hopeful sign of the beginning of a successful effort to differentiate State institutions and to bring within fair limits the degree-granting powers of endowed institutions.

The report further presents a study of the financial

status of college teachers as compared with the situation presented in a similar study published five years ago. The ordinary salary of a full professor in the institutions associated with the foundation is now 60*l.* During the last five years the salaries of instructors have risen by about 16*l.*; those of junior professors show a gain of from 24*l.* to 45*l.*; those of full professors show an increase from 25*l.* to 70*l.*

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

It is announced in *Science* that Lafayette College is a beneficiary under the will of the late Mr. William Runkle to the amount of 20,000*l.*

News has been received by cable that Prof. T. R. Lyle, F.R.S., is shortly to resign his professorship in the University of Melbourne, and that in consequence the chair of natural philosophy will become vacant. The salary attaching to the post is about 1000*l.* per annum, and the new occupant of the chair will be expected to take up his duties in February next, which is the beginning of the session.

The following gifts to higher education in the United States are announced in the issue of *Science* for June 5:—20,000*l.* anonymously for the erection of the first of Cornell University's residential dormitories; an unrestricted gift to Harvard University of 10,000*l.* by Mr. Nathaniel H. Stone; 5000*l.* under the will of Miss Elizabeth S. Shippen to the University of Pennsylvania; and 4000*l.* and a contingent interest in one-third of a 10,000*l.* fund to the Hampton Normal and Agricultural Institute by the late Mr. Robert C. Ogden.

LORD ROSEBERY has been elected president of the University of London Club, and the following have been elected vice-presidents:—Sir Thomas Barlow, Sir Robert Blair, Sir John Rose Bradford, Dr. Sophie Bryant, Sir Edward H. Busk, Mr. Clifford B. Edgar, Lord Emmott, Sir Rickman Godlee, Sir Alfred Pearce Gould, Dr. W. P. Herringham, Prof. M. J. M. Hill, Sir Alfred Hopkinson, Sir Joseph Larmor, Sir Oliver Lodge, Sir Philip Magnus, Sir Henry A. Miers, Lord Moulton, Sir William Ramsay, Sir Henry E. Roscoe, Sir William A. Tilden, Prof. H. H. Turner, and the Right. Hon. T. McKinnon Wood. The committee has elected 910 original members of the club, 709 men and 201 women. Mr. T. Ll. Humberstone has been appointed the first secretary of the club, and it is hoped that the club-house at 19 and 21 Gower Street will be open in July or soon afterwards.

THE annual report for the present year of the Nantucket Maria Mitchell Association has been received. One of the most useful of the activities of the association has been the provision from time to time of an astronomical fellowship, to which Miss M. Harwood was reappointed in March, 1913. Her research work, executed at the Harvard College Observatory, has included a study of several variable stars of the Algol type, for the purpose of determining accurate periods and the forms of their light curves. It is desired by the association to establish a permanent fellowship yielding annually 100*l.*, which will enable recent graduates of women's colleges to devote themselves for a year or more to advanced work in astronomy. A portion of the year may be spent at the Maria Mitchell Observatory and a part at Harvard College Observatory. It is hoped that one or more of these fellowships may be established by some former pupil of Miss Mitchell, open to graduates of Vassar, and that similar fellowships may be endowed for graduates of other colleges.

A REPORT on the teaching of mathematics in Australia, by Prof. H. S. Carslaw, presented to the International Commission on the Teaching of Mathematics, has just been published (Sydney: Angus and Robertson; London: Oxford University Press). The problem of mathematical teaching stands in much the same position now in Australia as it stood at home a few years ago. Reformers are struggling to improve school teaching, and they find the chief obstacle to be the external examination held by a body with a limited knowledge of the schools. New South Wales has cut the knot by deciding to substitute examinations by its own Department of Public Instruction, and Queensland and Tasmania are following suit. It is a pleasing sign that some of the examining bodies are acting on the Mathematical Association reports on teaching. The decision of the Mathematical Association Committee that the congruence theorems and the condition of parallelism should be taken as the axiomatic basis of logical geometry was not available when Prof. Carslaw's report was written, and we read that the Board of Education Circular 711 advocating much the same treatment is condemned by the New South Wales education authority. It is permissible to hope that this authority, which is the most open-minded in Australia, and has a high regard for the Mathematical Association, may by this last decision of the association be induced to reconsider its condemnation.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, June 4.—Prof. E. B. Poulton, president, in the chair.—Rev. G. Henslow: Darwin's alternative explanation of the origin of species, *without* the means of Natural Selection.—G. C. Robson: On a collection of land and freshwater gastropods from Madagascar, with descriptions of a new genus and new species. The affinities of the species examined were found to be mainly Oriental and not African.—Prof. H. H. W. Pearson: Notes on the morphology of certain structures concerned in reproduction in the genus *Gnetum*. This is an account of an investigation of (1) androgynous and pseudoandrogynous spikes of *Gnetum gnemon*; (2) the young embryosac of *G. africanum*.—Prof. C. Chilton: *Deto*, a subantarctic genus of terrestrial crustacea. *Deto* is a genus of terrestrial isopod, established in 1837 by Guérin for the species *D. echinata* from the Cape of Good Hope. The genus shows a typical subantarctic distribution and emphasises the close connection between the faunas of New Zealand and South America.

CAMBRIDGE.

Philosophical Society, May 18.—Dr. Shipley, president, in the chair.—Prof. Pope and J. Read: Optically active substances of simple molecular constitution. Notwithstanding numerous attempts, it has not hitherto been possible to prepare an optically active substance containing fewer than three carbon atoms in the molecule, and the assumption has therefore been made that a considerable degree of complexity is necessary to enable the molecule to exist in stable enantiomorphous forms. After unsuccessful attempts to resolve chlorosulphoacetic acid and chlorobromo-methanesulphonic acid the preparation and investigation of chloriodomethanesulphonic acid were undertaken with a similar object in view, and eventually the resolution of this substance was effected with *d*- and *l*-hydroxyhydrindamine, strychnine and brucine. The purest optically active ammonium salt of this acid yet obtained, having $[M]_{5461} + 43.7^\circ$ in dilute aqueous

solution, was prepared by repeated fractional precipitation with brucine, followed by decomposition of the brucine salt with ammonia; but the separation of the substance in a state of optical purity presents great difficulty. It is remarkable that the optically active ammonium salt, which, containing only one carbon atom in the molecule corresponding to less than 5 per cent. of carbon, is the simplest optically active substance known, retains its activity with great persistence, and cannot be caused to racemise by any of the ordinary agents employed for that purpose.—**Dr. Fenton**: Note on the detection of malonic acid.—**F. E. E. Lamplough** and **J. T. Scott**: Some further experiments on eutectic growth. The method of "quenching" an alloy during the solidification of the eutectic has been used to ascertain the character of the eutectic during its growth. Resulting from the investigation it has been possible to classify eutectics into two classes: (1) those of spherical radiating growth, (2) those exhibiting definite crystal contours. The former are always produced when both primaries are of rounded contour, the latter if one primary is of crystal shape. The cause of "halos" surrounding primary crystals has been demonstrated.—**W. H. Mills**, **H. V. Parker**, and **R. W. Prowse**: The resolution of 5-nitrohydrindene-2-carboxylic acid. With the object of obtaining an optically active derivative of benzene in which to account for the optical activity it would be necessary to take into consideration the relative distribution in space of the groups attached to the benzene nucleus 5-nitrohydrindene-2-carboxylic acid (III) has been prepared, and has been shown to be resolvable into two optically active components.—**R. D. Kleeman**: (1) The nature of the internal work done during the evaporation of a liquid. (2) The work done in the formation of a surface transition layer of a liquid mixture of substances.—**N. Wiener**: A contribution to the theory of relative position.

EDINBURGH.

Royal Society, May 4.—**Prof. James Geikie**, president, in the chair.—**Dr. D. M. Y. Sommerville**: Description and exhibition of a four-dimensional model. The analogue of the icosahedron in three-dimensional space is the four-dimensional figure bounded by six hundred regular tetrahedra. The model showed a projection of this figure in three dimensions, one vertex being used as the centre of projection. The model showed the successive zones of vertices which surround any vertex.—**Dr. C. G. Knott**: Changes of electrical resistance accompanying longitudinal and transverse magnetisation in iron and steel. The experiments established for iron and steel results very similar to those previously obtained with nickel. Thin ribbons about 2 cm. wide were used. It was found that the increase of resistance under a given longitudinal field was diminished when this longitudinal field was superposed upon a steadily maintained transverse field. In high transverse fields the increase due to the superposed longitudinal field was barely measurable; but in no case did the change become a decrease, as was noticed in the case of nickel. Again, the diminution of resistance due to the action of a transverse field became markedly increased when the transverse field was superposed upon a steadily maintained transverse. This curious result had also been obtained with nickel.—**Dr. R. Campbell**: Rocks from Gough Island, South Atlantic (Scottish National Antarctic Expedition). The specimens, which were collected by **Dr. J. H. Harvey Pirie**, were, with the exception of a small piece of limestone, all igneous, being mainly soda trachytes, trachydolerites, basalts, an essexite, and tuffs. The collection showed that the rocks of Gough Island had all been derived from a soda-rich

alkali magma, and that in all probability they had had a common origin with the rocks of the other volcanic islands in the Mid-Atlantic.

May 25.—**Dr. B. N. Peach**, vice-president, in the chair.—**A. D. Darbishire** and **M. W. Gray**: The inheritance of certain characters of the wool of sheep. The results, which dealt chiefly with thickness of fibre, were obtained with two crosses: (1) between the Southdown and the wild sheep of the island of Soay, (2) between the Southdown and the black-face. With regard to thickness of fibre, Southdown was almost completely dominant over the Soay sheep; and in the second case the cross with the Southdown had the effect of entirely cutting out the long coarse fibres of the black-face fleece. The mean character of the first-cross wool was almost exactly intermediate between those of the two parents of the cross.—**Dr. J. H. Ashworth**: A new species of *Sclerocheilus*, with a revision of the genus. There were only two known valid species, *S. minutus*, Grube, and *S. antarcticus*, the latter a new species represented by two specimens, one obtained by the Scottish National Antarctic Expedition at the South Orkneys, the other (*Eumenia oculata*, Gravier) by the second French Antarctic Expedition at Petermann Island, Graham Land. The external features of both species were described and figured, and the diagnosis of the genus amended. *S. minutus* was recorded for the first time from Ireland, Blacksod Bay and Clew Bay, co. Mayo.

PARIS.

Academy of Sciences, June 8.—**M. P. Appell** in the chair.—**G. Humbert** and **Paul Lévy**: Singular Abelian functions of three variables.—**A. Haller** and **R. Cornubert**: Syntheses by means of sodium amide. Derivatives of β -methylcyclopentanone. The preliminary introduction of an α -methyl group is necessary, before sodium amide can be usefully employed for further methylation. The final product is $\alpha\alpha\beta\alpha'$ -pentamethylcyclopentanone.—**Charles Moureu** and **Georges Mignonac**: The diagnosis of the primary, secondary, and tertiary bases. An ethereal solution of ethylmagnesium bromide serves as a reagent; secondary and primary bases giving off a molecule of ethane for each replaceable hydrogen molecule, whilst tertiary bases give no gas evolution.—**Amand Gautier** and **Paul Clausmann**: Fluorine in mineral waters. Fluorine is present in all mineral waters, hot or cold, in amounts ranging from 0.3 to 6.3 milligrams per litre. Waters of volcanic origin contain the largest proportion of fluorides.—**André Blondel**: The harmonic analysis of alternating currents by resonance.—**A. Lacroix** was elected perpetual secretary for the physical sciences in the place of the late Ph. van Tieghem.—**M. Coggia**: Observation of the comet 1914b (Zlatinsky) made at the Observatory of Marseilles. Position given for May 28.—**J. Guillaume**: Observations of the sun made at the Observatory of Lyons during the first quarter of 1914.—**Alex. Véronnet**: Some causes explaining the heat of the sun. The hypotheses regarding the source of the sun's heat—chemical action, radio-activity, attraction of meteorites—are critically examined and shown to be insufficient. The Helmholtz theory of the heat being due to the work of contraction is shown to be best in accord with facts, although even this view gives a shorter life for the sun than is required by geology.—**Maurice Gevrey**: The analytical properties of the solutions of partial differential equations.—**Richard Suppanschtsch**: A development in series of the powers of a polynomial.—**Frédéric Riesz**: Trigonometrical polynomials.—**Serge Bernstein**: The absolute convergence of trigonometrical series.—**T. H. Gronwall**: Some methods of summation and their application to Fourier's series.—**B. Bouliguine**: A property of the

Riemann function $\xi(t)$.—F. La Porte: The compensation of a quadrilateral.—H. Pelabon: Thermo-electric study of selenium-antimony mixtures. The existence of the definite compound Sb_2Se_3 was proved by these measurements.—Paul Pascal: Uranyl sulphocyanide.—R. Marcelin: The exchange of material between a liquid or a solid and its saturated vapour.—Maurice Curie: The deviations of atomic weights obtained with lead arising from different minerals. The atomic weight of lead derived from uranium minerals is lower and from monazite slightly higher than that of lead from galena. These results are in agreement with those predicted from the theory of radio-active transformations.—Philip E. Browning: The action of bromine on the hydroxides of lanthanum and didymium. These hydroxides, in suspension in dilute alkali solutions, dissolve in bromine with unequal velocities, the solution of the lanthanum being more rapid. A description is given of the application of this fact to a new and rapid method of separation of these two metals.—Edouard Bauer: The action of sodium amide upon some 1:5-diketones. Study of products of the reaction between sodium amide and the two ketones, benzaldiacetophenone and dibenzoyl-1:3-propane.—Milivoje Losanitch: The susceptibility of the ethylene lactones for fixing sodium derivatives of methylene compounds.—E. E. Blaise: The hydroxylamine derivatives of 1:4-diketones and N-oxy-2:5-dimethylpyrrol. The reaction between hydroxylamine and diacetylsuccinic ester is not comparable with that of the same reagent and 1:4 diketones. In the latter case only mono- and di-oximes are formed.—G. Courtois: Uranyl glycolate, and lactate and some uranyl salts of the polyacids of the fatty series.—Charles Dufraisse: The two stereoisomeric forms of benzoylphenylacetylene dibromide. The two isomers have been isolated, one of which is coloured and the other colourless.—Mlle. H. Van Risseghem: β -Pentene and some of its derivatives.—G. Chavanne: The ethylene isomerism of the α -bromopropenes.—Mme. E. Bloch: The modifications produced in the structure of roots and stems by an external compression. In all plants grown under compression there is an abundant liquefaction of the medullary parenchyma.—F. Gérard: Three new species of Chlenaceæ.—P. Hariot: Two new Chytridiaceæ.—J. Tissot: The mechanism of the inactivation of sera by dialysis. The conditions governing the dissociation of the soaps in the serum.—H. Violle: The pathogeny of cholera. The cholera bacillus only develops in a limited zone of the intestine, and only then if this zone is free from all biliary secretion. The liver is thus one of the natural defences of the body against cholera.—Th. Nogier and Cl. Regaud: The decrease in the radio-sensibility of malignant tumours treated with successive doses of X-rays. Auto-immunisation against X-rays.—M. Lécaillon: The phenomena of natural rudimentary parthenogenesis produced in *Turtur risorius*.—H. Stassano and M. Gompel: The considerable bactericidal power of mercuric iodide. Mercuric iodide has much greater power in killing bacteria than either mercuric cyanide, benzoate, or chloride. It is ten times as active as corrosive sublimate.—A. Fernbach and M. Schoen: New observations on the production of pyruvic acid by yeast.—Jean Groth: The Sierra Morena.—M. Dalloni: The tectonic of the Catalan Pyrenees and the supposed "nappe de Montsech."—Léon Lutaud: The raised beaches of the coast of Estérel.—Robert César-Franck: The relations between the geological constitution of the Isle of Wight and the form of its coast line.—Philippe Flajolet: Perturbations of the magnetic declination at Lyons (Saint Genis Laval) during the first quarter of 1914.

BOOKS RECEIVED.

- Meteorology in Mysore for 1912. By N. V. Iyengar. Pp. xi+56. (Bangalore: Government Press.)
- Report on the Lepidoptera of the Smithsonian Biological Survey of the Panama Canal Zone. By H. G. Dyar. Pp. 139-350. (Washington: Government Printing Office.)
- Report on the Progress of Agriculture in India for 1912-13. Pp. iii+69. (Calcutta: Government Printing Office.) 8 annas.
- Department of Lands and Survey, Western Australia. Handbook for Surveyors and Draftsmen. Compiled by N. S. Bartlett. Pp. ii+110 and Appendices. (Perth, W.A.: F. W. Simpson.)
- Mendels Vererbungstheorien. By W. Bateson. Translated by A. Winckler. Pp. x+375. (Leipzig and Berlin: B. G. Teubner.) 12 marks.
- Pflanzenanatomie. By W. I. Palladin. Translated by Dr. S. Tschulok. Pp. iv+195. (Leipzig and Berlin: B. G. Teubner.) 4.40 marks.
- The Social Guide. By Mrs. H. Adams and E. A. Browne. Pp. 264. (London: A. and C. Black.) 2s. 6d. net.
- The Elements of Chemistry. By H. L. Bassett. Pp. xii+368. (London: Crosby Lockwood and Son.) 4s. 6d.
- L'Harmonie Tourbillonnaire de l'Atome. By F. Butavand. Pp. 52. (Paris: Gauthier-Villars et Cie.) 2 francs.
- Chemical Calculations. By H. W. Bausor. Pp. iv+136. (London: W. B. Clive.) 2s.
- Chemical Calculations. (Advanced Course.) By H. W. Bausor. Pp. iv+48. (London: W. B. Clive.) 1s.
- Fortschritte der Mineralogie, Kristallographie, und Petrographie. Edited by Prof. G. Linck. Vierter Band. Pp. iv+384. (Jena: G. Fischer.) 12 marks.
- Lehrbuch der Biologie für Hochschulen. By M. Nussbaum, G. Karsten, and M. Weber. Zweite Auflage. Pp. viii+598. (Leipzig and Berlin: W. Engelmann.) 12 marks.
- Hypnose und Katalepsie bei Tieren. By Prof. E. Mangold. Pp. 82. (Jena: G. Fischer.) 2.50 marks.
- Die Mechanistischen Grundgesetze des Lebens. By A. Cohen-Kysper. Pp. viii+373. (Leipzig: A. Barth.) 7 marks.
- Modern Substitutes for Traditional Christianity. By E. McClure. Second edition. Pp. viii+224. (London: S.P.C.K.) 2s. 6d. net.
- Philosophy: What Is It? By Prof. J. B. Jevons. Pp. vii+135. (Cambridge: University Press.) 1s. 6d. net.
- Know Your Own Mind. By W. Glover. Pp. ix+204. (Cambridge: University Press.) 2s. net.
- Bacon's Large-scale Map of Australia. In four sheets mounted on cloth to fold in cloth case. (London: G. W. Bacon and Co., Ltd.) 25s.
- Psychopathology of Everyday Life. By Prof. S. Freud. Authorised English edition, with Introduction. By Dr. A. A. Brill. Pp. vii+342. (London: T. Fisher Unwin.) 12s. 6d. net.
- The Pursuit of Natural Knowledge. By Prof. J. R. Ainsworth-Davis. Pp. iv+284. (Cheltenham: Norman, Sawyer and Co., Ltd.) 1s. net.
- Minerals and the Microscope. By H. G. Smith. Pp. xi+116. (London: T. Murby and Co.) 3s. 6d. net.
- The History and Theory of Vitalism. By Prof. H. Driesch. Translated by C. K. Ogden. Pp. viii+239. (London: Macmillan and Co., Ltd.) 5s. net.
- The Thinking Hand: or Practical Education in the Elementary School. By J. G. Legge. Pp. x+217. (London: Macmillan and Co., Ltd.) 8s. 6d. net.

Memorials of Henry Forbes Julian. Written and edited by his Wife, Hester Julian. Pp. xix+310. (London: C. Griffin and Co., Ltd.) 6s. net.

Alcoholic Fermentation. By Dr. A. Harden. Second edition. Pp. vii+156. (London: Longmans and Co.) 4s. net.

Memoirs of the Department of Agriculture in India. Entomological Series. Vol. v., No. 1., Life-histories of Indian Insects; v., Lepidoptera (Butterflies). By C. C. Ghosh. Pp. iv+72+ix plates. (Pusa: Agricultural Research Institute.) 3s. 9d.

The Natural History of the Farm. By Prof. J. G. Needham. Pp. 348. (Ithaca, N.Y.: Comstock Publishing Co.) 1.50 dollars.

Edinburgh and East of Scotland College of Agriculture. Investigation into the Disease of Sheep called "Scrapie" (Traberkrankheit; La Tremblante), by Dr. J. P. McGowan. Pp. ix+116. (Edinburgh: W. Blackwood and Sons.)

Cambridge Manuals of Science and Literature: The Making of Leather. By H. R. Procter. Pp. x+153. The Sun, by Dr. R. A. Sampson. Pp. viii+141. Coal Mining. By T. C. Cantrill. Pp. viii+159. (Cambridge University Press.) 1s. net each.

Lehrbuch der Meteorologie. By Prof. J. Hann. Dritte Auflage. Lief. 4, 5, 6, 7. Pp. 289-640. (Leipzig: C. H. Tauchnitz.) 3.60 marks each.

The Oxford Survey of the British Empire. Edited by Prof. A. J. Herbertson and O. J. R. Howarth. The British Isles and Mediterranean Possessions. Pp. xii+596+7 maps. Asia, including the Indian Empire and Dependencies, Ceylon, British Malaya, and Far Eastern Possessions. Pp. x+505+5 maps. Africa, including South Africa, Rhodesia, Nyasaland, British East Africa, Uganda, Somaliland, Anglo-Egyptian Sudan and Egypt, etc. Pp. xvi+547+5 maps. America, including Canada, Newfoundland, the British West Indies, and the Falkland Islands and Dependencies. Pp. x+511+6 maps. Australasia, including Australia, New Zealand, the Western Pacific, and the British Sector in Antarctica. Pp. xii+584. General Survey, including Administration, Legal Problems, History, Defence, Education, Acclimatisation, Mapping, Commerce, Communication, Migration. Pp. viii+386+1 map. (Oxford: Clarendon Press.) 14s. net each.

DIARY OF SOCIETIES.

THURSDAY, JUNE 18.

ROYAL SOCIETY, at 4.30.—(1) Trypanosome Diseases of Domestic Animals in Nyasaland. *Trypanosoma Caprae*, Kleine. III: Development in *Glossina morsitans*; (2) Trypanosomes found in Wild *Glossina morsitans* and Wild Game in the "Fly-Belt" of the Upper Shire Valley; (3) The Food of *Glossina morsitans*; (4) Infectivity of *Glossina morsitans* in Nyasaland during 1912 and 1913: Sir D. Bruce, Maj. A. E. Hamerton, Capt. D. P. Watson and Lady Bruce.—A Description of the Skull and Skeleton of a Peculiarly Modified Rupicaprine Antelope *Myotragus balearicus*, Bate: Dr. C. W. Andrews.—The Relation between the Thymus and the Generative Organs, and on the Influence of these Organs upon Growth (With a Note by G. U. Yule): E. T. Halnan and F. H. A. Marshall.—The Vapour Pressure Hypothesis of Contraction of Striated Muscle: H. E. Roaf.—The Validity of the Microchemical Test for the Oxygen Place in Tissues: A. N. Drury.—Man's Mechanical Efficiency: Prof. J. S. Macdonald.—The Colouring Matters in the Compound Ascidian *Diazona violacea*, Savigny: Dr. A. Holt.—Some Accessory Factors in Plant Growth and Nutrition: Prof. W. B. Bottomley.—A Photographic Analysis of Explosion-flames Traversing a Magnetic Field: Prof. H. B. Dixon, C. Campbell, and W. E. Slater.

LINNEAN SOCIETY, at 8.—Reports on the Marine Biology of the Sudanese Red Sea: The Brachyura: R. Douglas Laurie.—A Revision of the Recent Colonial Astræidæ Possessing Distinct Corallites: G. Matthal.—Two Lithens: *Lecanora isidioides*, Nyl., from the New Forest; and *Parmelia revoluta* var. *concentrica*, Cromb., from Seaford Downs: R. Paulson.—Ecological Notes, chiefly Cryptogamia; the late W. West.—Life-histories and Descriptions of Australian *Æschina*. (With a Description of a New Form of Telephobia by H. Campion): R. J. Tillyard.—The Life-history and Structure of *Telephorus lituratus*: Miss Olga G. M. Payne.—Cucujidæ, Cryptophagidæ, avec une Description de la larve et de la nymphe de *Protomina convexiuscula*, Grouvelle: A. Grouvelle.—Mallophaga, Aphaniptera, and Diptera Puparia. (Percy Sladen Expedition): H. Scott.—Short Cuts to Nectaries by Blue Tits: C. F. M.

Swynnerton.—Photographs of Large-tailed Sheep of the Punjab: Dr. G. Henderson.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—Final Report on the Rivers Investigation: Dr. A. Strahan and Others.

MONDAY, JUNE 22.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration in the Unknown Brahmaputra Region on the North-Eastern Frontier of India: Captain F. M. Bailey.

VICTORIA INSTITUTE, at 4.30.—Annual Address: Jerusalem, Past and Present: Sir C. M. Watson.

WEDNESDAY, JUNE 24.

GEOLOGICAL SOCIETY, at 8.—The Trilobite Fauna of the Abbey Shales, near Hartshill: V. C. Illing.—Notes on the Trilobite Fauna of the Middle Cambrian of the St. Tudwal's Peninsula (Carnarvonshire): T. C. Nicholas.

THURSDAY, JUNE 25.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Note on Mr. Mallock's Observations on Intermittent Vision: Prof. S. P. Thompson.—The Variation of Electrical Potential across a Semipermeable Membrane: Prof. F. G. Donnan and G. M. Green.—The Potential of Ellipsoidal Bodies and the Figures of Equilibrium of Rotating Liquid Masses: J. H. Jeans.—The Twenty-seven-Day Period in Magnetic Phenomena: Dr. C. Chree.—Electrification of Water by Splashing and Spraying: J. J. Nolan.—Attempts to Produce the Rare Gases by Electric Discharge: T. R. Meriton.—The Analysis of Gases after Passage of Electric Discharges: O. C. G. Egerton.—*And other Papers.*

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