THURSDAY, MARCH 26, 1914.

THEODORE ROOSEVELT AS NATURALIST.

Theodore Roosevelt. An Autobiography. Pp. xii + 647. (London: Macmillan and Co., Ltd., 1913.) Price 10*s.* 6*d.* net.

THE autobiography of Theodore Roosevelt is a very interesting book to the politician or to the political anthropologist; but here I am rightly restricted to reviewing only that part of the book which touches on natural science.

When Mr. Roosevelt entered upon office as President, he found the American Government as represented by Congress and the Senate, comparatively indifferent to the conservation of beauty in the United States—beauty in the form of magnificent trees, magnificent wild beasts, remarkable and beautiful birds, and romantic landscapes. American Senators and Congressmen did not see—any more than British Chambers of Commerce see—that all such things were assets of great national value, of economic importance, indeed. The destruction of bird life throughout the United States was already causing far-reaching plagues of insects, which consumed fruit and vegetables on the extravagant scale in which all natural movements are carried out in North America. American politicians did not appreciate the frightful damage which was being done to the whole North American Continent—Canada as well as the United States—by the unchecked forest fires and the lumberman's lust for destruction amongst the timber of the United States' forests, without any thought of simultaneous measures being taken for reafforestation.

Mr. Roosevelt was not, of course, the first or the greatest pioneer in a movement which has already had most beneficial results in the conservation of beauty and natural resources, and has culminated in the attempt of the United States to set right the bird question throughout the world. Already in the 'eighties and 'nineties of the last century the idea of national parks had come into existence. The Yellowstone region was set apart as a reserve in which natural phenomena, natives trees, and native wild beasts could continue to exist for the wonderment and delight of a new generation. The Yosemite Valley and the big trees of California had been similarly protected from unreasoning destruction. But Theodore Roosevelt, though he had won his spurs as a hunter (and the best book that he wrote about wild life, by-the-by, is not his excellent work on East Africa, but "Outdoor Pastimes of an American Hunter"), had, by the time he became Vice-President, conceived a great love for the natural beauties of a landscape and the presence therein of bird and beast.

During his seven and a half years' tenure of the United States Presidency Mr. Roosevelt established, or caused to be established, fifty-one national bird reservations in seventeen of the United States, as well as in Porto Rico, Hawaii, and Alaska. Amongst these reservations was the celebrated Pelican Island rookery in Indian River, Florida—now world-famous from the beautiful scenes depicted by photography and kinematography; the Mosquito Inlet reservation in Florida (chiefly for the protection of the manati), the reservation of the Klamarth lake and marsh in Oregon (chiefly for the wild ducks, geese, and swans of the western United States); the Tortugas Quay, Florida, for studying the habits of seabirds and migratory birds; and the great bird colonies (for the protection of albatrosses and petrels) on the Island of Laisan in the Hawaii group, in which direction he intervened after the appalling revelations of bird slaughter by the plumage hunters were made known through the efforts of Dr. Hornaday, Mr. James Buckland, and others. His influence brought about the creation of five national parks—in Oregon, in South Dakota, Oklahoma, North Dakota, and Colorado, and the organisation of four big game reserves in Oklahoma, Dakota, Montana, and Washington, and game laws and game reservations in the vast territory of Alaska.

Mr. Roosevelt also secured the enactment of measures which in the United States not only saved the remains of the bison from extermination, but have led to the gradual increase in numbers and possible future existence of this remarkable bovine. But he has not yet succeeded in making the American Republic call the bison by its right name, instead of the misleading title of buffalo. He is, I fear, rather an advocate for the retention or adoption of a whole series of American misnomers—elk instead of wapiti; bobcat instead of lynx, mountain-lion instead of puma. In most cases these American terms are the more to be regretted since, with the exception of the puma, nearly all the great mammals of North America had representatives in the fauna of temperate Eurasia, and the English names for these creatures (wapiti, it is true, is Canadian) have a great ancestry going back to the earliest development of Aryan speech in the days of improved stone implements.

What Mr. Roosevelt did for forest preservation is set forth somewhat meagrely in the book under

review. Since his quitting the Presidency there has been a set-back under the four years of Mr. Taft, when the recalcitrant party in the Senate got its way, and the lumbermen were once more permitted to destroy unreasoningly. Mr. Roosevelt thoroughly appreciates the fact that the reafforesting of the United States is a matter of vital importance for climatic reasons, as well as for others, and that the disforesting of these vast territories either by the woodman's axe or by the forest fires, would be a legitimate cause of complaint for the adjoining Dominion of Canada, as the climate of Canada would be affected disadvantageously.

H. H. JOHNSTON.

AMERICAN TEXT-BOOKS OF BIOLOGY.

(1) *A Laboratory Manual of Invertebrate Zoology.* By Dr. G. A. Drew. Second edition, revised. Pp. ix + 213. (London and Philadelphia: W. B. Saunders Company, 1913.) Price 6*s.* net.

(2) *A Text-book of Biology.* For Students in Medical, Technical, and General Courses. By Prof. W. M. Smallwood. Pp. xiv + 285 + xiii plates. (London: Baillière, Tindall and Cox, 1913.) Price 10*s.* 6*d.* net.

(1) DR. DREW'S manual gives directions for the study of ninety-two invertebrates. The accounts of the various types selected for examination are noteworthy for the attention devoted to the reactions of the living creatures, and for the questions designed to test whether the student understands the functions of the several organs and comprehends the adaptations exhibited. In this second edition, the author has cited, at the end of the description of most of the types, a few of the chief memoirs dealing with those types. This is an excellent feature of the book, for the student who follows the lead given will be introduced to the literature of the subject and to the means of becoming acquainted with some of the best methods of modern zoological research. Little consideration is devoted to the larval stages and life-cycles of the types studied, and a detailed account of the internal anatomy of many of the types is not given; the author's intention has evidently been to single out the external features for special study in relation to adaptation. There are descriptions of twelve Polychætes, but of only two insects—a grasshopper and a bee; an account of one of the Diptera, *e.g.*, a mosquito, might have been added with advantage. The descriptions are carefully done, there being very few mistakes. In the section on Gregarina, the organism is said to encyst and form a spore-producing individual—a rather misleading statement. This portion of the life-cycle might have been treated in more detail, and reference made to the formation of gametes and of spores and sporozoites. The poison ducts of Lithobius open on the outer (not on the inner) sides of the second maxillæ.

An appendix contains precise instructions for making permanent preparations of organisms or of parts of them, and there is a useful glossary of terms employed in the book.

The student who works intelligently through the series of types selected for study will acquire a good general knowledge of the structure and chief adaptations exhibited by invertebrates.

(2) Prof. Smallwood has produced an interesting and readable volume, intended chiefly for medical students. Taking the frog as a convenient type, the author describes the physiology of movement, digestion, circulation, and metabolism, and then proceeds to outline the histology of the tissues, the structure of the nervous system, and the development (external features only). A brief account of Hydra and a very short sketch of the Protozoa follow. Succeeding chapters deal with the biology of cells and of yeasts and moulds, parasitism, some biological factors in disease, evolution, variation, heredity, and animal behaviour in its relation to mind. The chapters on variation and animal behaviour are especially interesting, as the illustrative examples are drawn from recent literature. The volume ranges over a wide field, and the accounts of some of the subjects are necessarily brief; in a few cases they are too brief to be of much value to the average student. The account of malaria will not give the student a very clear idea of the life-cycle, for, although the author states that the number of parasites becomes very great, he does not indicate the manner in which this large increase in number is brought about. But the author obviously intends his book to be supplemented by other instruction in the laboratory and lecture-room.

Several mistakes have been allowed to pass, *e.g.*, Bothriocephalus is cited as a type of the Round-worms, sea-anemones are included under Hydrozoa, malaria is stated to occur in frogs, and there are mis-spellings, *e.g.*, Wiederscheim, Unchinaria, etc.

The book contains 243 figures and 13 plates; the illustrations are nearly all well chosen and excellently reproduced, but the figure of Stomoxys represents a fly of entirely different aspect—certainly not a Stomoxys.

SUPERNATURAL RELIGION.

(1) *Modern Substitutes for Traditional Christianity.* By Edmund McClure. Pp. viii + 145. (London: S.P.C.K., 1913.) Price 2*s.* net.

(2) *Modern Rationalism as Seen at Work in its Biographies.* By Canon Henry Lewis. Pp. x + 418. (London: S.P.C.K., 1913.) Price 4*s.* net.

(3) *All Men are Ghosts.* By L. P. Jacks. Pp. ix + 360. (London: Williams and Norgate, 1913.) Price 5*s.* net.

(4) *The Latest Light on Bible Lands.* By P. S. P. Handcock. Pp. xii + 371. (London: S.P.C.K., 1913.) Price 6*s.* net.

(5) *The Divine Mystery.* By Allen Upward. Pp. xv + 309. (Letchworth: Garden City Press, Ltd., 1913.) Price 10*s.* 6*d.* net.

THE realities of spiritualistic belief are, so far, psychological, subjective. The pathetic paradox about its "apologetics" (science though this styles itself) is that it claims for its realities not only an objective, but a physical, existence. The apologist who condemns "mechanistic" and "materialistic" conceptions of the universe in the same breath introduces a series of super-mechanism and super-matter. Science can do nothing with spiritual entities until they are proved to exist objectively; when this is proved, then they become part of the subject-matter of science, and, therefore, part of the "stuff" of the universe. Matter and mechanism are good terms, but the spiritualist rages at them. The world-substance must be designated by some convenient term; one may serve as well as another; but it is absurd to object to a term because its popular significance suggests solidity and excludes mind.

It is a curious fact that the religion of Western Europe, which from its birth has had an uninterrupted career of success, should have been, from the first, "apologetic." Christianity certainly marked a development of the social consciousness; but it seems as if this apologetic attitude represented a certain mistrust of the spiritualistic material which this last of the old-world religions, and the first and only of the new world, carries with it, apparently as an essential content. The religious impulse is a fact of the emotional life, and with the majority of men requires expression. But Buddhism and Confucianism prove that the religious impulse may be satisfied with a subject-matter that is not supernatural or spiritualistic. If this is so, and if the Christian consciousness is at all mistrustful of traditional supernaturalism, then there is inevitably an air of insincerity about apologetics.

(1) Canon McClure, in an interesting sketch of some modern variations of the supernaturalist point of view, uses the language of science. Miracles, for instance, are "like the mutations or the 'sports' of modern Darwinism." This is good metaphor, but "metaphors are not reasons." He quotes an instance of a frequent temptation to use new scientific discoveries, which have changed our views of matter, as an argument for the objective reality of the supernatural:—

"The very active 'things' which give the atom being are called electrons, and the point of interest to religiously minded people is this, that we have, in these electrons, according to an investigator of world-wide reputation, the nearest analogy to the concept of a disembodied spirit, that is, a charge of electricity pure and simple."

This seems childish; at least, it has no bearing on the argument, and does not help us "to recognise more fully than before that nature and revelation are not in antagonism." The neo-vitalism of Bergson is metaphysical, not scientific. It is regarded by Canon McClure, together with James's similar speculations, as a strong buttress to traditional Christianity. The old religion is better and saner than the modern "substitutes"; why, then, should apologists waste time in trying to prove the material reality of the subject-matter of its creed? The permanence of the religious impulse is not, as this author thinks, a proof of the "validity" (*i.e.* material reality) of supernatural entities; it is a proof of the validity of the religious impulse. This, surely, is enough. The mysticism of Eucken, and the superman of Nietzsche, "theosophy" and "Christian science," "secularism" and "rationalism," are well described and "refuted." It is curious that they should need refutation by a Christian apologist.

(2) Canon Lewis treats of the life and death of famous "rationalists" or "agnostics" by way of showing that the religious temperament produces finer characters than does the agnostic. Voltaire, Paine, J. S. Mill, Renan, Bradlaugh, Spencer, Nietzsche, Goethe, Schopenhauer, George Sand, Shelley, Huxley, George Eliot, Sidgwick, Romanes, and others are described, with emphasis on their moments of dissatisfaction and despair, and with full details of the meannesses of which one or two were guilty. Canon Lewis seems to think that disbelief in the objective reality of certain tenets of Christianity proves a lack of "heart and soul." It proves nothing of the kind; but merely that the person has thought for himself, instead of taking his thinking at second-hand.

(3) "Supernaturalism" has a permanent interest for the imagination. The "ghost story" is as

popular to-day as it was with primitive man. The author of "Mad Shepherds" is an artist. Possibly he is a "believer" (the term always implies materialistic belief) in spirits. His stories of "Panhandle and the Ghosts," "All Men are Ghosts," and "Farmer Jeremy," are fine art, showing an obsession by, and yet a scientific control of, the ghost idea.

"'May it not be that Primitive Religion is the only religion that has ever existed, or will exist, in the world?'

'Panhandle,' I cried, 'you are a ghost!'

'Hush!' he answered, 'we never use that term in addressing one another. . . .'"

"The Magic Formula" is an entirely charming story of child psychology.

(4) Certain exigencies of commission make Mr. Handcock's readable account of archæological discovery in Palestine, Babylonia, Assyria, Egypt, and Syria into a popular illustration of the Hebrew tradition. Thus we find such statements as "the life of Gilgamesh, the hero of Babylonian folklore, whose history presents parallels to many ideas expressed or implied in the Old Testament."

"Khammurabi, probably the Amraphel of the Book of Genesis"; "the cause of Israel's migration to Egypt." It has still to be proved that Israel ever was in Egypt; that Khammurabi, and many other historical persons, are really mentioned in the Hebrew books; and that the cosmogony of *Genesis* is anything more than a digest of the Babylonian. The book is an excellent introduction to Mesopotamian and Egyptian archæology, though its particular bias may lead the novice to a wrong perspective. The author is fair enough; the monuments, he admits, "do not do more than mention a few isolated facts out of all that are recorded in the Bible." With the exception of the statement of Menephthah that "Israel is desolated," the first event in the history of Israel or its ancestors certainly attested by the inscriptions is "the invasion of Judah by Shishak under Rehoboam, and the first Israelites whom they mention by name are Omri and Ahab."

(5) Mr. Allen Upward has insight, and has written a suggestive book on the development of religion. The main idea—the Divine Man or Genius—and the stages of his career from medicine man to Messiah, are adaptations from "The Golden Bough"; but the author has had personal experience of savage thought and custom in Nigeria. He has also a sound knowledge of modern thought in general and of the "higher criticism" in particular, and his work, though eccentric in parts (lexicographers will dispute some derivations), has value as an attempt to trace the genesis of Christianity. The central theme, the idealisation of man and the practical work of prophet, priest, and king, is an interesting interpretation of history. But that it has been a predominant factor in the development of culture remains to be proved. A. E. CRAWLEY.

OUR BOOKSHELF.

A Manual of Petrology. By F. P. Mennell. Pp. iv+256. (London: Chapman and Hall, Ltd., 1913.) Price 7*s.* 6*d.* net.

THE writing of a clear and concise introduction to the study of petrology is fraught with extreme difficulty owing to the fact that the phenomena exhibited by rocks and rock-minerals are seldom capable of simple explanation, and thus the author is often led to assume a wider knowledge of cognate subjects on the part of the elementary student than is likely to be possessed. This book is framed upon a previous work by the same author, entitled, "An Introduction to Petrology"; in fact, a large portion may be regarded as a reprint. The author, however, has rejected much that was in the older publication, and has added new, well-selected matter, but the discussion of the phenomena presented by mineral sections when viewed in polarised light still leaves much to be desired.

Chapters i. to iii. are elementary in character, and deal with the general properties of minerals; the introduction of several tables, such as those dealing with specific gravity, colour, and refractive index, will be helpful to the student.

In chapters iv. to vii. the general characters of the rock-forming minerals are given, and often some simple means of differentiating any one from others which it resembles superficially. The number of species described, however, is slightly larger than is needed in a work of this kind.

The greater portion of the book deals with the classification of igneous rocks and their nomenclature, but mainly with the description of rock-types. The nomenclature has been reduced to its simplest form, and tedious description of unimportant variations have been avoided. The igneous rocks are followed by a brief account of sedimentary and metamorphic rocks.

The book is illustrated with 124 text-figures. Many of the illustrations are excellent, but a few of the figures, such as 66, 77, 86, 119, and 123, might be discarded without prejudice. The book may be described as well planned and methodically carried out; and it gives a good idea of the general nature and scope of the science.

Logging: the Principles and General Methods of Operation in the United States. By Prof. R. C. Bryant. Pp. xviii+590. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1913.) Price 15*s.* net.

THIS text-book on forest utilisation, well printed and fully illustrated, is a very useful addition to the scanty literature on the subject in the English language. The author, who is a professor in the

Yale Forestry School, had formerly practical experience in the lumber camps of the United States and Philippines; and in consequence has been able to give a readable account of the numerous logging methods which are actually in operation. The book should prove suggestive to owners of timber lands in our own Colonies and to Indian foresters.

The first part is general, and comprises chapters on the resources and protection of the forests of the United States. The original woodland area is estimated at 850,000,000 acres, containing about 433,000,000,000 cubic feet of timber. The existing forest has shrunk to 550,000,000 acres, estimated to contain 210,000,000,000 cubic feet, of which the Federal and State Governments control about one-fourth. The second part deals with felling of timber, and contains chapters on labour, tools, organisation of the camp, careful utilisation of the tree, etc. The third part is devoted to transport by land, and is very complete, giving an account of aerial cables, railways, timber slides, and shutes, etc. The rude but efficacious system, by which railroads are often built in the forests of the Far West, is carefully described. The fourth part, transport by water, treats of floating, rafting, flumes, sluices, etc. Another part entitled "Minor Industries," deals with tapping for turpentine, harvesting of tanbarks, etc. A glossary of terms used in logging, tables of wages, timber values, etc., complete this admirable text-book.

Foods and Household Management. A Textbook of the Household Arts. By Prof. Helen Kinne and Anna M. Cooley. Pp. xv+401. (New York: The Macmillan Company, 1914.) Price 5*s.* net.

A FULL treatment is provided in this volume of the production, cost, nutritive value, preparation, and serving of a great variety of foods. The relation of these topics to general household management is made clear, and a careful study of household accounts, methods of buying, and ordinary housewifery is included. Though some parts of the book deal particularly with American conditions, most of the chapters make a direct appeal to teachers of domestic subjects in this country, and the volume deserves their attention.

The Continents and their People. South America. By J. F. Chamberlain and A. H. Chamberlain. Pp. ix+189. (New York: The Macmillan Company, 1913.) Price 3*s.*

THIS beautifully illustrated reading book will serve admirably to supplement the ordinary text-book in use by children studying the geography of South America. The physical and human aspects of geography are presented in such a way as to interest young pupils and to encourage them to trace the connection between the two. There are only three maps in the book; one is an old-fashioned coloured plate, another a photo-relief map of the continent, and the third a sketch map showing rainfall.

LETTERS TO THE EDITOR.

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

The Movements of Floating Particles.

IN reply to Mr. Archdall Reid (March 19, p. 60) I should say that the effects which he describes are the natural behaviour of a contaminated surface. A greasy contamination of the right order of magnitude tends to spread itself uniformly over the surface. If when the liquid in the saucer sways over to one side, the surface layer went with it, the contamination would be concentrated upon that side and diluted upon the other. Such a displacement is resisted. The invisible surface contamination remains nearly equally distributed, and the fact is witnessed by the visible particles floating upon it. R.

Weather Forecasts.

IN NATURE of February 26 Mr. Mallock verifies the forecasts for London during 1913. He selects four characteristic types accompanying shifts of wind, and finds that the verification did not exceed 58 per cent. The temperature forecasts were even less accurate, being correct only 161 times; and while the given percentage is 52, a truer value, including doubtful and "no" forecasts, would be 44. He then, very properly, raises the question, reduced to its simplest terms, "Is the daily chart with its many entries worth while?" Personally Mr. Mallock thinks it extremely improbable that trustworthy forecasts can be made. Many meteorologists share this opinion. Two deductions can be drawn, either the chart does not contain data suitable for trustworthy forecasting, or the men who forecast are not competent. The latter we can quickly dispose of, for there is no difference of opinion regarding the honesty and professional skill of the staff of the Meteorological Office; and incidentally we may acknowledge the steady rise of the office under Dr. Shaw's progressive leadership to a commanding place among the meteorological services of the world.

Then is the weather chart inadequate? Yes. Moreever, it will be so for years to come. On the other hand, too much may be expected, and a method of verification applied that is entirely too rigorous. Weather is not the only subject on which forecasts are made, and if these were rigorously tested there would be many verifications below 50 per cent. Not long ago, the writer had gently to remind the editor of a metropolitan daily "that the forecaster in his statements concerning things that had not yet happened was more accurate than the Press (in general) in its statements concerning things that had already happened." Errors in law, medicine, and engineering are neither unknown nor infrequent.

To ask for a definite statement of weather conditions twenty-four hours in advance, is asking much in view of the number of indeterminate variables that are operative. Pressure, temperature, air motion, and precipitation are not definite, regular processes, but often erratic and complicated. From our knowledge of the laws of gases we may indeed work out certain functional relationships, but we are still far from determining actual interferences due to circulation, absorption, and radiation.

Shall the chart then be abandoned, and shall we

cease troubling ourselves with millions of useless observations to be added to millions already existing? No. It is an honest effort, and granting that there is surplusage of certain data, the chart is still worth while. Besides, there are some by-products of great value. To illustrate, a strict verification of the wind shifts at San Francisco, a city where the lower air circulation is marked, might show a high percentage; but this would not be a fair test of the worth of the weather chart. Rather, some by-product, as that of frost protection. In the first week of January, 1913, the general forecaster warned the orange-growers 480 miles away of impending trouble. Each community was warned not once, but day after day, and night after night. Fruit worth 10,000,000*l.* was in jeopardy. Half was saved because of ample, accurate warnings coupled with improved methods of heating, covering, and protecting. Overtopping the vast saving, was the demonstration that protection was effective. The story of the campaign against frost extending over a period of sixteen years and culminating in the struggle of January, 1913, is one of the most inspiring chapters in the history of horticulture. The forecaster not only gave warning, but developed the principles of protection. At least five basic patents for covering, heating, and mixing the air were obtained and donated to the public.

Again, a certain railroad system of the west coast in competition with all steam railroads of the United States was awarded the Harriman Memorial safety medal. In five years not a single passenger's life has been lost through collision or derailment of trains in a total equivalent movement of 8,000,000,000 passengers one mile. What has this to do with the weather chart? Only this, that during those five years at times of greatest strain, during heavy rains when road-beds wash out, and derailments most easily occur, the actual head of the whole system kept in closest touch with the weather office. Time and time again the patrols on thousands of miles of roads were doubled on the judgment of the forecaster, based on the chart.

Yet, in San Francisco, it has been known to turn out fair when rain was indicated, or some sudden drizzle from the sea mar a forecast of fair weather.

And the conjecture of De Morgan which Mr. Mallock quotes, "that Sir George Airy would not have given 2½*d.* for the chance of a meteorological theory formed by masses of observations," remains a conjecture.

ALEXANDER MCADIE.

Blue Hill Observatory, March 11.

Origin of Structures on the Moon's Surface.

THE difficulty raised by the Rev. O. Fisher (NATURE, February 26, p. 714) with regard to the origin of the moon by fission from the earth has been answered already in part in Sir George Darwin's own writings. The length of the day when earth and moon revolved once a day was calculated by him at first as about 5 hours, the figure used by Mr. Fisher. Afterwards, Darwin showed that taking solar tidal friction into account, this period should be reduced to something of the order of 2½ hours, when the two bodies would be almost in contact (see Darwin, "Scientific Papers," vol. ii., pp. 323, 364). It may not be amiss to quote here his cautious estimate of this result:—"The whole subject is full of difficulties, and the conclusions must necessarily remain very speculative."

F. J. M. STRATTON.

Gonville and Caius College, Cambridge.
March 6, 1914.

The Isothermal Layer of the Atmosphere.

IT is a commonplace observation that "truths of science, waiting to be caught," are often simultaneously and independently "caught" by two or more investigators. One of the most remarkable coincidences of this kind appears never to have been definitely pointed out as such. This is the recent Gold-Humphreys (or Humphreys-Gold) explanation as to why the stratosphere is vertically isothermal; viz., because of equality in that region between emitted and absorbed radiation. This discovery is probably destined to remain conspicuous in the annals of meteorology for two reasons; first, because of its intrinsic importance, and, secondly, because of the following remarkable chronological parallelism in its independent development by two investigators:—

Gold.	*Humphreys.*
Preliminary account read at the Dublin meeting of the British Association for the Advancement of Science, September 2–9, 1908.	Preliminary account read at the Hanover meeting of the American Association for the Advancement of Science, June 29–July 3, 1908.
Preliminary account reported in NATURE, October 1, 1908.	Preliminary account reported in *Science*, August 21, 1908.
Final paper received by the Royal Society of London, October 5, 1908.	Final paper sent to the *Astrophysical Journal*, October ?, 1908.
Final paper read before the Royal Society of London, December 10, 1908.	Final paper read before the Philosophical Society of Washington, D.C., October 10, 1908.
Final paper published in the Proceedings of the Royal Society of London, A 82, February 16, 1909.	Final paper published in the *Astrophysical Journal*, vol. xxxix., January, 1909.

It would be difficult to find a more interesting chronological parallel. It is particularly pleasant to add that the principals, who up to the time of the publication of their papers were strangers to each other, have since then become well acquainted and the best of personal friends.

C. FITZHUGH TALMAN.

U.S. Weather Bureau, Washington, March 7.

Unidirectional Currents within a Carbon Filament Lamp.

DURING the past two months I have shown to some scores of people the effects described by Dr. Eve under the above heading, in NATURE of March 12. His explanation of the slow creep of the displaced filaments back to their original positions does not seem to me wholly satisfactory. Other factors governing the phenomenon are the electromagnetic attractions between the current bearing loops and the plastic yielding of the heated filament. It was a search for the latter effect which first directed my attention to the other phenomena.

The negative discharge from a Wimshurst machine also alters the luminosity of the filament, and I have observed in some cases (using a modified Fleming valve), the complete stoppage of the thermionic current. These two latter effects are now being systematically investigated.

F. LLOYD HOPWOOD.

Physics Department, St. Bartholomew's Hospital Medical College, E.C., March 17.

THE ARCHÆOLOGICAL SURVEY OF NUBIA.[1]

WHEN it was decided to heighten the Aswân Dam, the Egyptian Government also made provision for the thorough examination of the whole tract of country that would be immersed in the enlarged reservoir south of the First Cataract. An account has already been given in NATURE (1911, vol. lxxxvi., p. 283) of the surprising richness of the harvest of historical and archæological results, which Dr. Reisner's precise methods and skill in interpretation were able to rescue from this unpromising and poverty-stricken site during the first six months' work in 1907–1908. For in that short time not only were the main outlines of Nubia's chequered history and strange vicissitudes unveiled, but also, incidentally, considerable light was shed upon many points that hitherto had been obscure in the history of Egypt and the Sudan.

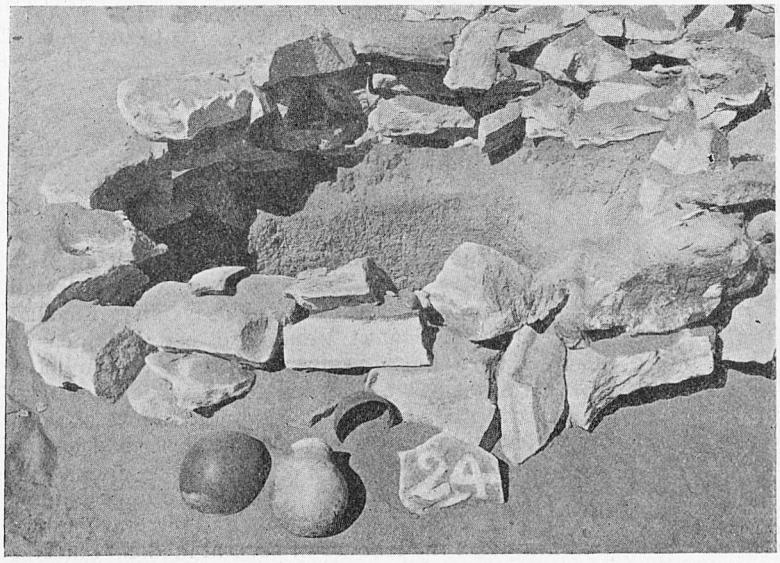

FIG. 1.—Cemetery 87. Groups of C-group superstructures. Grave 24, pottery in position at foot of superstructure. From "The Archæological Survey of Nubia. Report for 1908–9."

So successfully was this work accomplished during the first season's work of the Survey (where, fortunately, the materials brought to light in the neighbourhood of the First Cataract supplied a summary of the whole history of Nubia) that the other three seasons' work could be devoted to filling in the details of the story.

It was very fortunate that it was possible to put together the historical framework at the very commencement of the work, for during the following season Dr. Reisner, who had organised the whole undertaking and set the high standard of scientific accuracy and thoroughness for his successor to live up to, had to relinquish the personal control of the survey in order to resume his work in Syria and at the Giza Pyramids for the Harvard University and the Boston Museum. Happily Mr. Cecil Firth, who had been intimately associated with Dr. Reisner for several years, was available to carry on the work in the spirit and with the thoroughness with which it was begun. In the volumes lately issued the results of the second season's work (mainly Dr. Reisner's) have been fully presented with a conciseness and lucidity distinctive of Mr. Firth's writing.

The district with which the first season's work was concerned chanced to be especially rich in Predynastic and Early Dynastic remains, and thus enabled us at the outset to begin at the beginning and appreciate the condition of Lower Nubia when it was ethnically and archæologically a part of Egypt. The second season equally fortunately yielded most information concerning the succeeding period, when a distinctively Nubian culture was manifesting itself; and these data, which form the outstanding feature of the volumes before us, follow naturally upon the Early Dynastic and Egyptian phase of Nubia's history.

From the time of the Third Dynasty there was a rapid decline of Egyptian influence in Nubia, associated with a degradation of its essentially Proto-Egyptian culture and the infusion of negro blood into its population. "The condition of the country, owing to its isolation from Egypt, had reached a very low ebb, perhaps the lowest in its history, and it is not surprising to find it suddenly displaced by, or incorporated in, a new and vigorous barbaric civilisation which is very obviously southern in its origin, and in no way related to that of contemporary Egypt. It would appear that there was a considerable influx from the south of a slightly negroid population, which brought with it a peculiar culture and art which has very marked affinities with that of Predynastic Egypt in its earliest stage" (pp. 13 and 14). The new and precise information concerning this people which suddenly made its appearance in Lower Nubia "at some time between the Old and the Middle Kingdoms," *i.e.* roughly about 2500 B.C., is the outstanding distinctive feature of this report. Both in the physical characters of the people and the nature of their culture, which is so admirably described in these volumes, this Middle Nubian people is nearly akin to the earliest Predynastic Egyptians; but the two branches of the race became separated the one from the other, and developed independently, one in Egypt, the other further south under the influence of contact with the negro population of Africa. When the latter people, after a separation of perhaps nearly ten centuries, moved north and came into contact

[1] "The Archæological Survey of Nubia. Report for 1908–9. By C. M. Firth. Vol. i., part i., Report on the Work of the Season, 1908–9. Part ii., Catalogue of Graves and their Contents. Pp. vi+209. Vol. ii., Plates and Plans accompanying vol. i. 56 plates+xx plans. Cairo: Government Press, 1912.) Price L.E. 2 (for the two volumes).

with the Egyptians, their culture seems strangely alien, for it retained many features that had been extinct in Egypt for centuries, but now reappear strongly tainted with the effects of negro influence. After reading the masterly interpretation of these data relating to the first appearance of a distinctively Nubian culture in Lower Nubia, it is easy to understand how these puzzling facts have so far misled all other recent writers who have discussed Nubian archæology.

A very interesting feature of this report is the account of the superstructures that are found in association with these Middle Nubian graves, sometimes in the form of "a low dome of stonework (Fig. 94), composed of circular corbelled courses, somewhat analogous to the mud-brick corbel vaults of the Protodynastic period in Egypt" (p. 14), sometimes a simple cairn of stones roughly thrown together or more extensive circular walls of stone surrounding the grave, often with a little 'chapel' for offerings on the east or north-east side. As the derivation of these types

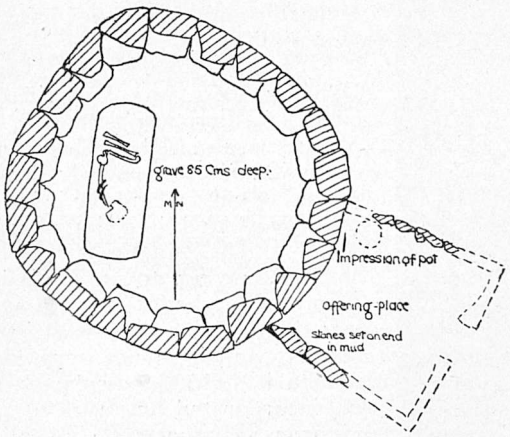

FIG. 2.—Cemetery 87. Grave 61. From "The Archæological Survey of Nubia. Report for 1908–9."

of superstructure from known Protodynastic Egyptian forms is unquestioned, it is very instructive to note that precisely similar circular stone monuments (with offering chapels) have puzzled writers on Algerian archæology (see MacIver and Wilkin's "Libyan Notes," 1901, Chapter xii.), who have not hesitated to class them with the megalithic group of structures in that region.

Limitation of space alone prevents a complete enumeration of all the other important features of these volumes. Further light is thrown upon the destruction of this characteristic Nubian culture, which flourished between the Sixth and Thirteenth Dynasties, by the Egyptian colonisation which followed the military expeditions of Usertesen III. And here, as elsewhere in Mr. Firth's report, it is clearly shown how the facts brought to light in these archæological investigations corroborate and supplement the known historical evidence.

There is now much more precise information concerning an interesting group of negroid people which made its appearance in Nubia between the second and sixth centuries A.D. They appear to be Nubas from Kordofan, perhaps the Nobadae brought into Nubia under Diocletian to check the incursions of the Blemmyes, who in turn were probably the nomadic kindred or descendants of the Middle Nubians who had taken to the Eastern Desert.

The interesting mud-brick forts at Koshtamna, built originally somewhere about the time the famous Giza Pyramids were being erected in Egypt, and frequently repaired and extended in subsequent ages, are fully and lucidly described. So also is the fortified Byzantine town of Sabagura.

There is also much new information concerning the Ptolemaic-Roman and Byzantine periods in Nubia.

The main part of the report consists of the detailed field notes, illustrated by numerous excellent woodcuts and a large volume of photographs and maps. This magnificent record of Prof. Reisner's and Mr. Firth's characteristically thorough survey of an extensive tract of difficult country will be indispensable to everyone who wants to understand the real history of the Nile Valley.

G. ELLIOT SMITH.

THE CRIMINAL AND THE CRIME.[1]

MR. GORING'S Blue Book on the English convict is unquestionably a product of immense patience and industry. In a preface contributed by Sir E. Ruggles-Brise, it is stated that, "In 1901 Dr. Griffiths, Deputy Medical Officer of Parkhurst Prison, formed the idea of subjecting a large number of prisoners convicted of certain similar offences to accurate measurements in order to ascertain whether these showed any deviation from what may be described as the normal, *i.e.* non-criminal persons." Under the encouragement of the Prison Commissioners, especially of Sir Bryan Donkin and Sir H. Smalley, and through the labours of several medical officers, the work grew in scope and magnitude. Ultimately it was placed in the hands of Dr. Goring, who was detached from duty with the view of tabulating the material at University College, with the assistance, and under the direction of Prof. Karl Pearson.

"It soon became apparent that the scope of the work had grown, perhaps inevitably, far beyond its original purpose, viz.: the refutation or confirmation, of the various theories that had been promulgated concerning the existence of the criminal type. It will be seen that the work now embraces a wide range, including not only an analysis of the physical and mental conditions of convicts, but also the data for speculation on very difficult and contentious questions as to the relative influence of heredity, environment, etc. Although the commissioners had not contemplated in the first instance a work of this magnitude, they feel it only fair to Dr. Goring that the work should be published on his own lines, and that

[1] "The English Convict. A Statistical Study." By Dr. C. Goring Pp. 440. (London: His Majesty's Stationery Office; Wyman and Sons, Ltd., 1913.) Price 9s.

the public should be in possession of the mass of information collated, and statistically tabulated by him, and of the conclusions he draws therefrom. It must also be explicitly understood that the commissioners are not in a position to endorse all the conclusions at which he arrives, or to criticise the method employed in attaining them, as any attempt in this direction would involve an elaborate discussion of matters on which the highest scientific authorities differ."

Part I. of Dr. Goring's work is devoted to an examination of the theories of the late Prof. Cesare Lombroso and his followers. These are shown, we think, quite conclusively to be erroneous. The matter is one eminently suitable for statistical handling. Lombroso stated that criminals are mentally and physically abnormal. A large number of convicts have been examined, and the abnormalities have not been found.

No evidence has emerged confirming the existence of a physical criminal type such as Lombroso and his disciples have described . . . there is no such thing as a physical criminal type (p. 173) . . . there is no such thing as a mental "criminal type" (p. 246).

In chapter i. of part II. we find another statistical summary which must be accepted unless, as is very improbable, it can be shown that the facts are not correctly stated. Convicts as a class are physically and mentally inferior to the general population. They are, on the average, shorter, lighter, and stupider. Thieves, burglars, and incendiaries are especially defective. Criminals convicted of violence or fraud are little, if at all, inferior. A third

indisputable statistical fact has emerged from the investigation. It is that the family incidence of crime is not fortuitously distributed, it is not entirely independent of lineage; that criminals do not occur equally in *all* families of the general community, but tend to be restricted to *particular stocks* or sections of the community: to those stocks tainted with criminal ancestry. And we have found that the intensity of this limitation, the intensity of this parental resemblance in criminal propensity, ranges between 0·45 and 0·6 (p. 364).

But the greater portion of part II. consists of debatable matter. Statistics are not merely summarised, they are interpreted. The inferences are not immediate, but mediate. It is probable that the very facts on which Dr. Goring relies would be used by opponents as foundations for quite contradictory conclusions. Facts very similar actually have been so used times without number. For instance, a generation ago the British Association appointed an anthropometric committee to ascertain the statures and weights of persons engaged in different occupations, in accordance with the principle that—

"The occupation of an individual explains not only the direct effects of physical or mental work on the constitution of the body, but the kind of nurture or sanitary surroundings to which he may have been subjected." The Committee found "the most obvious facts which the figures disclose are the check which growth receives as we descend lower and lower in the social scale."

Dr. Goring's comment is—

"The figures disclose no such check upon growth as an obvious fact. The facts actually revealed are that, as we descend lower and lower in the social scale, the means of stature and weight diminish in value. There is no evidence that the diminution is caused by a check upon growth due to environmental conditions. An inference from these facts of equal validity with the Committee's deduction would be that descent in the social and economic scales of life is associated with a physical inferiority of human stock; in other words, that the professional man, labourer, and artisan, &c., breed their own kind, who in turn pursue the calling of their fathers, *i.e.* the work most suited to their social station, and to their particular type of physique" (p. 193).

Here we have the old dispute as to whether nature or nurture is the stronger. Dr. Goring sets himself the task of "disentangling the influence of *heredity* from a complication of *environmental* influences" (p. 337).

"As seen in the above table, 177, the parental correlation for sexual crimes and crimes of wilful damage to property, is from 0·45 to 0·5; for stealing it is from 0·48 to 0·58. We would assume then from this evidence, that the intensity of the inherited factor in criminality is from 0·45 to 0·5, and the intensity of criminal contagion is anything between 0·05 and 0·1" (p. 367). "Our second conclusion, then, is this: that relatively to its origin in the constitution of the male-factor, and especially in his mentally defective constitution, crime is only a trifling extent (if to any) the product of social inequalities, of adverse environment, or of other manifestations of what may be comprehensively termed the force of circumstances" (p. 371).

In these and many other passages, Dr. Goring appears to maintain strongly that the criminal is born, not made; that parentage counts for much, and training for little; that the child of a criminal has, on the average, the "proclivity" or "diathesis" so strongly developed that he will be a criminal no matter what the circumstances in which he is reared. With some surprise, therefore, we read near the end of the work:—

"But this fact of resemblance does not argue absence of the influence of environment in the development of human beings. It is as absurd to say that, because criminal tendency is heritable, a man's conviction for crime cannot be influenced by education, as it would be to assert that, because mathematical ability is heritable, accomplishment in mathematics is independent of instruction; or that, because stature is heritable, growth is independent of nutriment and exercise. Our correlations tell us that, despite of education, heritable constitutional conditions prevail in the making of criminals; but they contain no pronouncement upon the extent to which the general standard of morality may have been raised by education. We know that to make a law-abiding citizen two things are needed—capacity and training. Within dwells the potentiality for growth; but without stands the natural right of each child born into the world—the right to possess every opportunity of growing to his full height" (p. 373).

This passage is a little vague. Probably instead of "conviction for crime" Dr. Goring means "proclivity for crime," or "chances of conviction for crime." He seems clearly of the opinion that "training" is necessary to make of a normal

individual a law-abiding citizen. Presumably such a man may be trained to lawlessness also. He has the capacity for both. In which case the special "proclivity" or "diathesis" of criminals can be nothing more than mere stupidity, mere incapacity to be trained. As expressed by Sir Bryan Donkin :—

"They are, it seems, innately unable to acquire the complex of characters which are essential to the average man, and, according to their surroundings, they follow the path of least resistance. This path is more often than not, but by no means always, the path of unsocial or criminal action" (p. 7).

In conclusion Dr. Goring states :—

"Our tables of figures speak for themselves, we have said; but we do not claim that they utter the last word. . . . A long intimacy with the material discussed in the present Report leads us to believe that better material could, with the experience now attained, be procured; but we are convinced that, at least to a first approximation, our data represent the fundamental interrelationships of criminality" (p. 373). In a note he adds :—"The inquiry, which of all others is most urgently needed, must not be limited to an examination of prisoners and their official records; but must extend beyond the prison walls, and into the homes and haunts of the offenders when at large; and into that wide and most interesting field of research where the experiments of the modern reformatory system are dealing with the child-criminal of the race" (p. 373).

SIR JOHN MURRAY, K.C.B., F.R.S.

THE tragic accident by which Sir John Murray lost his life on March 16 has deprived the world of one of the foremost naturalists of the day, and has sent a thrill of sorrow through the hearts of all who knew him. Though he had passed the allotted span of threescore years and ten, he still so abounded in youthful spirits and enthusiasm, was so active alike in body and mind, so full of work and of plans for further enterprise, that it is hard to believe that a career so distinguished in its past and bearing such continued promise for the future, has been suddenly brought to a close.

Of Scottish parentage, he was born in Canada in 1841, and received there the early part of his education. But in his youth he came to Edinburgh, and at the University there, under J. H. Balfour, P. G. Tait, G. J. Allman, and A. C. Brown, he received the training in physical and natural science that formed the groundwork of his lifelong labours. He soon showed the bent of his disposition towards marine studies, and at the same time his love of personal adventure, by taking, in the year 1868, a voyage in a Peterhead whaler to Spitsbergen and the Arctic seas. In the same year there began that series of pioneering cruises in the *Lightning* and *Porcupine*, by which, during the summers of 1868, 1869, and 1870, Wyville Thomson and W. B. Carpenter obtained so much new information regarding the distribution of life in the ocean. Deep-sea exploration became then a leading preoccupation among the naturalists of this country.

Eventually the general interest in this subject found vent in an application to the Government for a vessel and funds to prosecute the study of the ocean all over the globe. The memorable expedition of the *Challenger* was accordingly organised, which lasted from 1873 to 1876. Wyville Thomson, who had been elected in 1870 to the Chair of Natural History in the University of Edinburgh, was appointed director of the civilian scientific staff of the expedition. Recognising the brilliant promise of John Murray, he chose him to be one of the three naturalists on his staff. To this momentous choice the young aspirant to scientific distinction owed the opening which led to all the varied labours which have made his name so widely known.

When Wyville Thomson died in 1882, Murray, who had proved his remarkable qualities during the course of the expedition, was charged with the editorship of the scientific results of the cruises of the *Challenger*. This was a task the greatness of which is probably not generally appreciated. No ordinary skill, knowledge, tact, and patience were required to allocate the vast pile of collections to the different specialists all over the globe, to keep these writers up to their engagements, and, within reasonable limits of time, to see that the printers and engravers were supplied with material, to supervise the masses of proof-sheets, and, by no means least of all, to battle with an unsympathetic Treasury that grudged the heavy expense necessarily required for the publication of the work of the most completely organised expedition that had ever sailed the seas. Year after year the labours of the editor went on, until some fifty massive quarto volumes were issued. That Murray should have emerged with triumphant success from so prolonged and so trying an ordeal was a striking proof of the strength of his character and the vigour of his scientific enthusiasm.

Besides taking an active part in the dredging and the general biological work of the expedition, Murray specially devoted his attention to the working out of certain parts of the materials obtained. He was more particularly interested in the investigation of the deposits that are accumulating on the floor of the ocean. The ample store of materials which he succeeded in gathering together was subsequently carefully studied by him in concert with the late Prof. Renard, of the University of Ghent, and the conjoint work of the two observers was published as one of the thick quartos of the *Challenger* Reports. This monumental volume possesses a high scientific value, coupled with the historical interest that it gave to the world the first detailed revelation of the nature and distribution of the deposits that are gathering on the floor of the deep sea, and the impressively slow rate at which some of these deposits are being formed.

A further inquiry arising out of the operations of the *Challenger* expedition was the question of the origin of coral islands. The fascinating explanation of these islands proposed by Darwin had been generally accepted by men of science, though

some doubts had been thrown upon its universal application. Murray, who was not always disposed to accept the conclusions of his predecessors without subjecting them to rigorous investigation, was led to entertain more than doubts as to the general applicability of Darwin's theory. He ultimately came to the conclusion that the extensive oceanic submergence which the great naturalist's explanation demanded could not be proved from coral reefs. He propounded another view in which he was supported by the late Alexander Agassiz, who undertook many cruises over different oceans, visiting most of the coral regions and obtaining an unrivalled acquaintance with their various features. According to this view, coral reefs have grown up on submarine volcanic peaks, which in many cases have been covered with thick accumulations of calcareous organisms, so as to be brought up within the limits of the growth of reef-building corals. The problem probably cannot be solved by any one universally applicable hypothesis. Whether or not subsidence has played a part in the formation of coral islands there can be no doubt, from the full narratives of Agassiz, that proofs of elevation are conspicuously obvious in many of the groups of these islands.

Sir John Murray's latest expedition took place only four years ago, when at his request the Norwegian Government lent him a surveying vessel, the *Michael Sars*, together with its scientific staff, for a summer cruise of four months in the North Atlantic Ocean, while he himself undertook to defray all the other expenses. The cruise proved highly successful, but perhaps its most important result has been the preparation and publication of a work on the "Depths of the Ocean," the joint production of Sir John himself and Dr. Johan Hjort. This handsome volume is undoubtedly the best and most authoritative treatise on the subject to which it is devoted. It places clearly before the reader the main incidents in the history of the investigation of the deep sea, and it describes the methods of research and the general scientific results obtained, with fresh illustrations from the experience gained in the cruise of the *Michael Sars*. Sir John had already been recognised as one of the chief founders of the modern science of Oceanography, and in this admirable volume he has left what will long be the leading manual on the subject.

It was at his instance that upwards of five-and-twenty years ago the British Government was led to annex Christmas Island, a lonely volcanic peak in the Indian Ocean, which seemed never to have been disturbed by man. He sent out some competent observers to study its geology and natural history, and these visitors found it to be rich in phosphatic deposits. He thereupon formed a company, which obtained a concession to work these accumulations. With the wealth that accrued to him from this source, he has been a generous supporter of scientific investigation in many directions. One of the undertakings which he set on foot and financed was a thorough bathymetrical survey of the freshwater lochs of Scotland by practised observers. The results of this investigation have been published in a series of six volumes. There is probably no other country of which the depths and other features of its lakes have been so fully made known.

Sir John Murray's devotion to science and his sagacity in following out the branches of inquiry which he resolved to pursue were not more conspicuous than his warm sympathy with every line of investigation that seemed to promise further discoveries. He was an eminently broad-minded naturalist to whom the whole wide domain of Nature was of interest. Full of originality and suggestiveness, he not only struck out into new paths for himself, but pointed them out to others, especially to younger men, whom he encouraged and assisted. His genial nature, his sense of humour, his generous helpfulness, and a certain delightful boyishness which he retained to the last endeared him to a wide circle of friends who will long miss his kindly and cheery presence.

ARCH. GEIKIE.

PROF. E. S. HOLDEN.

PROF. HOLDEN, whose death was announced with regret in our last issue, was better known to the astronomers of the last generation than the present. He will be remembered as one who, by his energy and position, encouraged the enterprise and activity that have characterised the development of astronomical research in the United States. It was his fortune, thirty years ago, to be placed at the head of the Lick Observatory, the optical equipment of which was then superior to any that existed. Also the position of the observatory had been selected with care and at considerable expense. He had to construct a programme and to pursue it with such ardour and success that the results should justify the costly erection of the gigantic refractor in a spot remote and difficult of access. In his work as a pioneer he had little to guide him, for though telescopes had gradually increased in power, they had been employed mainly in doing more perfectly what small telescopes had attempted. We may claim that the Lick telescope in his hands was a success. It is, of course, difficult to separate the work of a director from that of the subordinates selected to carry it into effect. The one provides a programme, but the performance must be largely in the hands of the lieutenants.

Prof. Holden was fortunate in the choice of his assistants and in the apportionment of their work. His assistants all increased their reputation under his direction, and demonstrated the capacity of the instrument entrusted to their charge. Barnard added an inner satellite to the Jovian system; Burnham's double-star work remains unsurpassed; Keeler's successful demonstration of the meteoritic constitution of Saturn's rings and his determination of the motion in the line of sight of the planetary nebulæ would have made the reputation of any observatory. Naturally some credit for these successes attaches to Prof. Holden. But his

own activities contributed not a little to the high estimation in which the observatory was held. Foremost, perhaps, should be placed his monograph on the nebula of Orion, a useful and painstaking piece of work. Of more originality were his studies of the physical constitution of the sun and its surroundings, the outcome of several eclipse expeditions, some earlier than the appointment to the Lick Observatory. Planetary markings and close examination of the surfaces of such minute discs as those of Jupiter's satellites or the planet Uranus also engaged his attention. The helical forms of nebulæ were the subject of intimate study, and in other directions Prof. Holden displayed equal energy and ability.

Considering the difficulty of getting a new observatory into efficient working order, increased as these difficulties were by the inaccessibility of the situation, it will be admitted that the twelve years' direction from 1885 to 1897 accomplished much useful work. In the latter year Prof. Holden resigned the position of director of the Lick Observatory, and his scientific activities apparently ceased. W. E. P.

NOTES.

THE Bakerian Lecture of the Royal Society will be delivered by Prof. A. Fowler on Thursday next, April 2, upon the subject of "Series Lines in Spark Spectra."

WE announce with regret the death on March 23, at sixty-eight years of age, of Prof. G. M. Minchin, F.R.S., formerly professor of mathematics, Royal Indian Engineering College, Coopers Hill.

WE regret to see the announcement of the death on February 17, at sixty-two years of age, of Dr. G. J. Burch, F.R.S., formerly professor of physics at University College, Reading, and the author of a number of papers upon electrical subjects and physiological optics.

THE eighth annual meeting of the British Science Guild will be held at the Mansion House on Friday, May 22, at 4 o'clock p.m., when the Lord Mayor, the Right Hon. Sir T. Vansittart Bowater, Kt., will preside. The annual dinner will be held at the Trocadero Restaurant on the same date, at 7.30 p.m., under the chairmanship of the president of the guild, the Right Hon. Sir William Mather, P.C.

THE enormous drain on the mammalian life of the world caused by the fur-trade is strongly emphasised in the following extract from an article in the *Times* of March 19 on the London spring fur-sales:—"Yesterday there were sold in the morning 183,754 skunk skins; in the afternoon 136,623 American opossum and 80,242 raccoons, as well as 3,602 civet cats. To-day will be offered 430,401 skunks, and to-morrow 2,500,000 musquash of various classes. In all there will be sold more than 4½ millions of musquash skins; and it is no wonder that the once familiar musk-rat 'houses,' which used to dot every lake and pond all over the United States, looking like great mole-hills sticking up from among the rushes, are growing scarce." During the three weeks of the sale it is probable that 10 or 12 million skins will have been sold.

THE discovery of ancient human remains in German East Africa by Dr. Hans Reck, of the Geological Institute of Berlin University, may prove to be an event of some importance to anthropologists. The report of the discovery, published in the *Times* of March 19, leaves us in some doubt as to the antiquity and racial characters to be assigned to these East African human remains, but apparently they are of mid-Pleistocene date, and show the distinctive features of the negro. If such prove to be the case, we must conclude that the negro race was already evolved in Africa at an earlier date than is now generally supposed. The *Times* report also informs us that the man thus discovered had thirty-six teeth—four more than is given to human and anthropoid races. The teeth are also said to show marks of filing; it would indeed be a remarkable fact if the habit of filing the teeth, so common in modern African races, should have been in use at the early date assigned to these prehistoric remains.

THE International Phytopathological Conference summoned by the French Government in conjunction with the Italian Government to meet at the International Institute of Agriculture was inaugurated by his Majesty the King of Italy on February 24, and was brought to a conclusion on March 5, in the presence of all the fifty delegates, who represented the thirty-five States which took part in the conference. By the proposed International Convention adhering States pledge themselves in the first place to take whatever legislative and administrative measures are necessary to prevent the distribution of all diseases of plants in their own countries, but specially to organise an effective service of supervision over nurseries, gardens, glasshouses, and other establishments which carry on a trade in living plants. The measures which adhering States would pledge themselves to take include (*a*) the erection of one or more institutes for scientific studies and research; (*b*) the organisation of an effective service of supervision over nurseries, including the packing and dispatch of plants; (*c*) the issue of phytopathological certificates. They would bind themselves only to admit plants accompanied by phytopathological certificates issued by or from a competent official authority, except in the case of plants which are imported for scientific research at an institute authorised by the Government.

MARCH bids fair this year to establish a record for rainfall, and at Greenwich, where the aggregate rainfall to the morning, March 23, was 3·54 in, the total for the whole month has only been greater in two years during the last century, from 1815. The heaviest record fall is 4·05 in. in 1851, and in 1905 the measurement was 3·57 in.; the latter was exceeded by rain during the day, March 23, and there are nine days which seem likely to be wet, to secure a total of 0·52 in., which will render the present month the wettest March on record for the last one hundred

years. At Greenwich there have in all only been eight years with the March rainfall more than 3 in. since 1815. Rain has fallen every day in the month to March 23, with the exception of March 1 and 2, and on March 8 and 9 the aggregate rainfall was 1·43 in., whilst the average for the whole month is 1·46 in. At Camden Square the total rain for the month to March 23 is 4·12 in., which is 0·43 in. more than in any previous March during the last fifty-five years. On March 22 the shade temperature at Greenwich was 29°, which is as cold as any previous reading since January 25, and the terrestrial radiation temperature on March 22 was 18°, which is lower than any grass temperature since January 24. The Greenwich records for the sixty years 1850–1909 show that frost has occurred in thirty-one years on March 22, so that the chances are in favour of frost on that day, whilst on March 20 frost has only occurred in twelve years, which gives the chance of 5 to 1 against frost.

A COMPLIMENTARY banquet was given by members of the medical profession to Surgeon-General Gorgas, sanitary officer of the Panama Canal Commission, on Monday, March 23. Sir Thomas Barlow (president of the Royal College of Physicians) occupied the chair, and the company included many distinguished representatives of medical science. Earlier in the day Surgeon-General Gorgas delivered a lecture before the Royal Society of Medicine on his sanitary work in Panama. In the course of his lecture he said that one-third of the canal zone is low and marshy, and had the reputation for four hundred years of being one of the most unhealthy regions in the world. It is probable that more white men have died there from tropical diseases than at any other place within the tropics. The French began work on the canal in 1880, the Americans in 1904. During the intervening twenty-four years it had been discovered that malaria and yellow fever are transmitted from one human being to another by the mosquito—malaria by the anopheles, and yellow fever by the stegomyia. These discoveries enabled health conditions at Panama to be controlled. Had the Americans known no more about these two diseases in 1904 than did the French in 1880, he did not believe that they could have done any better.—The degree of Doctor of Science, *honoris causâ*, was conferred upon Surgeon-General Gorgas at a special Convocation of the University of Oxford on Tuesday, March 24.

ON Wednesday, March 18, a portrait of Sir William Ramsay, painted by Mr. Mark Milbanke, was presented to the University of London, University College, on behalf of a committee of subscribers, consisting mainly of former colleagues and past students, by Prof. J. Norman Collie. Prof. Collie directed attention to the scientific achievements of Sir William Ramsay. While an assistant in Glasgow, Sir William Ramsay, together with Prof. Dobbie, discovered the fact that a certain number of acids obtained by oxidation of compounds obtained from bone oil and coal tar were identical with the products obtained by oxidation of the alkaloids. After that, when he was professor at University College, Bristol, he brought out a very large amount of extremely interesting work in physical chemistry. On coming to London and University College, his first great discovery, made in conjunction with Lord Rayleigh, was that of argon; and this was followed soon afterwards by the isolation of helium from clevite. Following up these two discoveries, Sir William Ramsay, after five years' hard work with Prof. Travers, succeeded in finally obtaining from the atmosphere three more elements —neon, krypton, and xenon. After this, Sir William Ramsay investigated the emanation that comes off from the element radium. This he obtained in the pure condition above mercury, and noticed that it gradually decomposed and that helium resulted. The portrait was accepted by the Vice-Chancellor of the University (Dr. W. P. Herringham) and by the chairman of the managing subcommittee of University College (Dr. J. Bourne Benson). A replica of the portrait was presented to Lady Ramsay, on behalf of the subscribers, by the Provost of the college in token of the esteem and affection in which Sir William and Lady Ramsay are held at University College. The gift was briefly acknowledged by Lady Ramsay and Sir William Ramsay.

IN the *Times* of March 17 E. Naville gives a further account of his remarkable discoveries at Abydos. He has found a great rectangular reservoir, which is shown to belong to the period of the temple of the Sphinx, when building with enormous stones without ornament came into fashion. This he believes to be the oldest stone monument, in the architectural sense, in Egypt. Some of the pyramids may be older, but, except for the inner chambers, they are without architectural plan. This reservoir was used for the storage of water in high Nile; and it is a remarkable fact that the beginning in architecture is neither a temple nor a tomb, but a gigantic water-work, showing that even in this early period the people had carefully observed the laws of the rise and fall of the Nile, and of the processes of infiltration.

IN the *National Geographic Magazine* for February Mr. W. J. Showalter contributes an interesting article, illustrated by a fine series of photographs, showing how the opening of the Panama Canal has been delayed by the earth slides, particularly in what is known as the Culebra Cut. It was only with the deepening of the canal bed in 1910 that these obstacles became really formidable; in all some thirty million cubic yards of material have been removed. Mr. Showalter describes the geological conditions of the area, with eleven groups of bedded rock and six of igneous formations, the result of volcanic action and uplifting of marine strata. The engineers now intend to check erosion in the Culebra Cut by covering the banks with vegetation, and the ships of the future will pass between banks of tropic green, except at those places where the living rock defies the efforts of the forester.

IN his presidential address to the Society for Psychical Research (published in the current number of the society's Proceedings), Prof. Henri Bergson asked "what would have happened if modern science,

instead of setting out from mathematics to turn its attention towards mechanics, physics, and chemistry, instead of bringing all its forces to converge on the study of matter, had begun by the consideration of mind—if Kepler, Galileo, and Newton, for example, had been psychologists." He answered that our psychology would have been almost inconceivably different from what it is. "Foreign to every mechanistic idea, not even conceiving the possibility of such an explanation, science would have inquired into, instead of dismissing *a priori*, facts such as those you study. Vitalism," he continued, "is a sterile doctrine to-day. It will perhaps not be so always, and it probably would not have been so had modern science at its origin taken things at the other end."

THE current number (February, 1914) of the *Journal of Genetics* contains papers dealing with several aspects of the problem of heredity. Mr. R. K. Nabours writes on inheritance in Paratettix, an American genus of locusts. In addition to *P. texanus*, Hanc., he found eight varieties which differ in their colour patterns, and are given new specific names. The inheritance of these colour patterns in crosses is found to be Mendelian in the sense that segregation occurs in the F_2 offspring, the species *P. texanus* being recessive to all the others. In the F_1 the colour patterns of both parents are equally developed, so that there is no phenomenon of dominance. In the experiments, five "unexpected individuals" appeared, which seem to have been due to germinal changes. Long and short wings were found not to be inherited, but to be controlled by environment. Mr. Richardson contributes a note on inheritance in strawberries, and Mr. Salmon describes sterile male dwarfs in the hop. In continuing his studies on the effects of environment on parthenogenetic and sexual reproduction in Cladocera, Mr. Agar concludes that "there is no justification for retaining the hypothesis of an inherent reproductive cycle," the transition from one type of reproduction to the other being entirely under environmental control. Dr. C. J. Bond describes an hermaphrodite Formosan pheasant having the secondary sexual characters of a male on the left side and of a female on the right, and suggests an explanation based on hormones. The utility of the paper on reduplication series, which deals with highly questionable Mendelian hypotheses, is problematical.

THE revived interest in the study of Thysanoptera among English entomologists is shown by the publication of two important papers in a recent number of the *Journal of Economic Biology* (vol. viii., No. 4) on British species of the order, by Mr. C. B. Williams and Mr. R. S. Bagnall respectively. A number of new species are described in each paper. Mr. Williams also describes some new forms from the West Indies.

THE lately issued part of the *Bulletin of Entomological Research* (vol. iv., part 3, 1913) is mostly occupied by two papers combining geographical and economic interest. Dr. J. J. Simpson describes his journeys for entomological research in British West Africa, giving much ecological information and a map to show the ascertained range of five species of Glossina in Sierra Leone. Mr. A. D. Peacock discusses the "Entomological Pests and Problems of Southern Nigeria," describing the principal insects that injure the staple crops of the country—cotton, cocoa, maize, yams, and rubber. The stages of the red "cotton stainer"—a heteropterid bug, *Dysdercus superstitiosus*, are described and illustrated with coloured figures; excellent illustrations of other harmful species are also given.

IN the February number of *Naturen* Dr. A. W. Brøgger discusses certain "kayaks" discovered in Scotland and the isles—two of them so long ago as the seventeenth century—which have been regarded as of a Scandinavian, or rather Finnish, type. Dr. Brøgger states, however, that this is altogether wrong, and that the kayaks, together with the associated paddles and other implements, closely resemble those used at the present day in Greenland. How they reached Scotland and the Orkneys is briefly discussed.

THE greater portion of the third part of vol. iv. of the Annals of the Transvaal Museum is occupied by papers on the results of the zoological section of the Percy Sladen Memorial Expedition to Great Namaqualand in 1912–13, of which section Mr. Paul Methuen was in charge. Mr. Austin Robert supplies the list of mammals collected, while the reptiles and amphibians are discussed by Messrs. Methuen and John Hewitt, and the arachnids by Mr. Hewitt. New species in each of the three last-mentioned groups are described.

As the result of a fifteen weeks' sojourn in South Georgia during the Antarctic summer of 1912–13, Mr. Cushman Murphy (Bull. Amer. Mus. Nat. Hist., vol. xxxiii., p. 63) was led to believe that old males of the sea-elephant had become exceedingly scarce, and that not sufficient were left to impregnate the females. According, however, to the taxidermist who accompanied Major Barrett-Hamilton, this was a temporary deficiency due partly to the visits of a sealing vessel belonging to the Compañia Argentina de Pesca, and partly to an unprecedented slaughter of some 600 males in a single season. During the past season fair-sized and large males are reported to have been relatively numerous.

WE have received from the secretary of the Commission on Zoological Nomenclature, in conformity with the instructions of the congress which require that a year's notice be given before any official exceptions to its rules can be allowed, a memorandum praying for the retention of the old generic names Doliolum, Pyrosoma, Salpa, Cyclosalpa, Appendicularia, and Fritillaria, signed by the following workers on Tunicata:—C. Apstein, A. Borgert, G. P. Farran, G. H. Fowler, R. Hartmeyer, W. A. Herdman, J. E. W. Ihle, H. Lohmann, W. Michaelsen, G. Neumann, C. Ph. Sluiter, F. Todaro. How far the present confusion would be worse confounded by conformity to the new rules may be seen by the fact that what every zoologist knows as Pyrosoma would be called Doliolum, and a new name would have to be coined for the well-known plankton key-form at present termed Doliolum.

IN the *Izvestiya* of the Imperial Academy of Sciences of St. Petersburg (February, 1914) Madame H. I. Poplavska publishes some preliminary results of her botanical researches in the neighbourhood of Lake Baikal. The fauna of the lake exhibits such peculiarities that Prof. Berg has defined it as a subregion of the holarctic region, but the flora has hitherto aroused little interest. The lake affects the distribution of rainfall and the temperature, the summers being much colder in the neighbourhood of the lake than in the surrounding parts of Siberia. Consequently the climate is similar to that of alpine regions and lofty peaks, and the flora is adapted to such conditions. Madame Poplavska mentions several forms peculiar to the Baikal area, some of which differ in so many points from their allied forms in other regions that they may be considered independent species, while others, not having as yet fully adapted themselves to local conditions, show few divergences, and can only be styled varieties. The habitat of these forms and their relation to allied species do not support the view that they are a relict flora.

COUNT DE MONTESSUS DE BALLORE examines the so-called luminous phenomena of earthquakes in a paper published in the latest bulletin of the Seismological Society of America (vol. iii., pp. 187–90). Referring to Galli's catalogue of 148 earthquakes during which luminous phenomena were reported, he shows that the time-intervals between these phenomena and the earthquakes are very variable and sometimes considerable, the accounts come indifferently from the epicentral areas and from distant regions, and the lights appear more frequently from the atmosphere than from the ground. In the great catalogues of Chinese earthquakes, luminous phenomena are never described as attending earthquakes. Two cases are examined in detail. The lights seen during the Valparaiso earthquake of 1906 were probably due to a thunderstorm, and those during the earthquake of November 16–17, 1911, in Germany and Switzerland to meteors. The author concludes that, in the present stage of our knowledge, the existence of luminous earthquake phenomena should be neither affirmed nor denied, but that all the facts at our disposal tend to a negative conclusion.

THE current number of *Symons's Meteorological Magazine* contains an interesting account by Mr. A. H. Hignett of the peculiar behaviour of a cyclonic whirl or tornado which did an immense amount of damage in Cheshire on the evening of October 27 last. It lasted only a few minutes, and its track was about 150 yards wide. It was accompanied by vivid lightning, heavy rain, and a loud noise, said to resemble that of "hundreds of motor-cars crashing through the trees." On entering the county of Cheshire from the north of Shropshire and travelling in a northerly direction, it seems to have risen in the air and passed over about seven miles of country without doing any damage, and then to have descended and struck a tree standing alone in a field smashing it to pieces. It then apparently rose again for about $1\frac{1}{4}$ miles, and afterwards descended and travelled along the foot of the Peckforton Hills (600–700 ft. above sea-level), destroying trees and buildings in its track, and eventually passed into Lancashire near Runcorn. The wind is described as warm, but in South Wales, where the cyclone occurred earlier in the day, it was said to be icy cold. This bounding motion of the whirl is probably by no means an isolated case, and seems to point to another danger to which aviators may be exposed.

DR. P. W. BRIDGMAN, of the Jefferson Physical Laboratory, Harvard University, whose high-pressure research is well known to our readers, has communicated to the American Academy a paper on the technique of high-pressure experimenting which will be of great service to all who wish to follow him in dealing with physical measurement under pressures of ten to thirty thousand kilograms per square centimetre. He gives details of his methods of packing, the construction of his pistons and cylinders, and the connection of his pipes, valves, and pressure gauges. The paper appeared in the February number of the Proceedings of the American Academy.

NO. 209 of the Scientific Papers of the Bureau of Standards deals with the recent determinations of the latent heat of fusion of ice by Messrs. Dickinson, Harper, and Osborne, of the bureau. The natural or artificial ice was cooled in a cryostat to either $-0{\cdot}7°$ C. or $-3{\cdot}78°$ C. before insertion in the calorimeter. Its weight was determined while suspended in the cryostat. Both the electrical method and the method of mixtures were used in measuring the heat of fusion. The former method allows the temperature of the calorimeter to be kept nearly constant during the melting of the ice, and the cooling correction is therefore small. Ninety-two samples of ice were tested, commercial can, plate, and natural ice, and ice made in the laboratory from air-free distilled water were used, and the heat of fusion found to be the same for each to within one part in 1000. The final result is 79·63 calories per gram.

IN the third of his six lectures on new problems of theoretical physics, recently published (in German) by the Ernest Kempton Adams Fund of Columbia University, Prof. W. Wien discusses in an illuminating manner the various electronic theories of the conduction of heat and electricity through metals. The practically infinite conductivity at the absolute zero, rendered probable by the researches of Kamerlingh Onnes, is explained if we assume that the distribution of molecules at the lowest temperatures is perfectly regular, so that the displacement of electrons along certain lines encounters no resistance. The irregularity of distribution induced by rise of temperature and consequent thermal agitation reduces the free path of the electrons, and hence also the conductivity. There is some evidence to show that it is only the mean free path, and not the number of electrons or their mean velocity, which is affected by temperature. Indeed, the lecturer inclined to the belief that even at the absolute zero all electrons have an irreducible kinetic energy, such as is required by the persistence of both diamagnetism and photo-electric effects at the lowest temperatures, not to speak of the expulsion of electrons by radio-active substances in entire in-

dependence of the temperature. The question as to whether canal-ray ions emit light in the charged or the uncharged condition is discussed in the sixth lecture. Bärwald showed in 1911 that a magnetic field stops but a small portion of the light emission, whereas most of the positive ions are deflected. This tells in favour of the view that the luminous bodies are uncharged. Even Reichenheim's observation that the whole of the luminous emission from an alkaline-earth anode may be deflected does not invalidate this view, since in this case the mean free path was very small, and every atom was probably charged at least once in the course of its passage.

THE increasing adaptation of enzymes to chemical purposes is well illustrated by the utilisation of urease, by Dr. R. H. Aders Plimner and Miss R. F. Skelton (*Biochemical Journal*, vol. viii., p. 70), in the rapid estimation of urea in urine. The action of the urease of the soy bean has quite recently been shown to be entirely specific; in the communication cited details are given of a process by means of which a rapid and accurate method of estimation is afforded of a substance the analytical determination of which has always presented some difficulty and uncertainty.

DURING the past few years several active principles have been isolated from ergot which account for most of its peculiar physiological properties; certain other effects have, however, been observed which have not been satisfactorily explained hitherto. In the current number of the *Biochemical Journal* (vol. viii., No. 1) Mr. Arthur J. Ewins describes the isolation from ergot of traces of acetylcholine, a base which produces a peculiar inhibitor effect on the heart, suggesting that caused by muscarine, which had been frequently observed to characterise the use of ergot. That this base is responsible for the effect was shown not merely by its actual isolation from ergot, but by the fact that the synthetic base, prepared from choline, has an identical physiological action.

THE following books relating to science are announced by Gebrüder Borntraeger, of Berlin:—"Die wichtigsten Lagerstätten der 'Nicht-Erze,'" Prof. O. Stutzer, Teil. ii., Kohle, Allgemeine Kohlengeologie, illustrated; "Ueber die Bedingungen der Gebirgsbildung," Dr. K. Andrée, illustrated; "Beiträge zur chemischen Petrographie," Prof. A. Osann, Dritter Teil; "Geologischer Führer durch Nordwest-Sachsen," Dr. E. Krenkel, illustrated; "Praktikum der chemischen, biologischen und bakteriologischen Wasseruntersuchung," Prof. O. Emmerling, illustrated; "Geologische Charakterbilder," edited by Prof. H. Stille, illustrated, Heft 18, 19, 20.

THE following new books are announced by C. Griffin and Co., Ltd.—In *Biology*.—Practical Field Botany, A. R. Horwood, illustrated; in *Chemistry*—A Text-Book of Inorganic Chemistry, edited by Dr. J. Newton Friend, in nine volumes; Elementary Practical Chemistry, for Medical and other Students, J. E. Myers and J. B. Firth; The Storage of Petroleum Spirit, Major A. Cooper-Key; The Petroleum Technologist's Pocket Book, Sir Boverton Redwood and A. Eastlake, illustrated; Oil Chemists' Pocket-Book, Dr. H. Ingle and J. A. Sutcliffe; The Raw Materials of the Enamel Industry and their Chemical Technology, Dr. J. Grünwald, translated by Dr. H. H. Hodgson; in *Engineering*—An Introduction to Town Planning, J. Julian, illustrated; in *Geology*—A Text-Book of Geology, Prof. J. Park; in *Medical Science*—A Practical Handbook of the Tropical Diseases of Asia and Africa, Dr. H. C. Lambart, illustrated; in *Metallurgy*—The Metallurgy of the Non-Ferrous Metals, Prof. W. Gowland, illustrated; Practical Assaying, Prof. J. Park, illustrated; in *Technology*—Clay and Pottery Industries, being vol. i. of the Collected Papers from the County Pottery Laboratory, Staffordshire, by several authors, edited by Dr. J. W. Mellor, illustrated; in *Miscellaneous*—Roberts-Austen: Addresses and Scientific Papers, together with a Record of the Work of Sir William Chandler Roberts-Austen, K.C.B., F.R.S., compiled and edited by S. W. Smith, illustrated; Memorials of Henry Forbes Julian, compiled and edited by his wife, Hester Julian, illustrated.

OUR ASTRONOMICAL COLUMN.

THE FORTHCOMING TOTAL SOLAR ECLIPSE.—While the various official and private expeditions are making preparations for observing the total solar eclipse of August 21 next, steamship companies are offering enticing pleasure cruises which include a brief stay on the line of totality on the Norwegian coast. As the last total solar eclipse visible in England took place so far back as the year 1724, and as 1927, the time for the next one, is as yet some time off, the opportunity to view the eclipse of this year should not be lost. The Royal Mail Steam Packet Company's ocean yachting steamer, *Arcadian*, twin screw, and 8939 gross tonnage, is timed to leave Grimsby on August 15 and Leith August 16, and will take up a position near Alsten, north of Torghatten Island, well on the central line. The Norway Travel Bureau of the Great Northern Railway Company has also arranged a special cruise. Passengers leave Newcastle-on-Tyne by the ss. *Venus* on August 15, and join the special steamer *Mira* at Bergen on August 17, a position being taken up at Stokka on eclipse day. It is stated that if a party of seventy-five to eighty members of the Royal Astronomical Society and the British Astronomical Association would avail themselves of this facility no other passengers would be accepted, and the itinerary would be varied to meet the requirements of the party, and the stay at any place in the eclipse zone prolonged.

A MONTHLY REPORT ON MARS.—Prof. W. H. Pickering has commenced the publication of a series of monthly reports on the appearance of the planet Mars. The first of these was printed in the January number of *Popular Astronomy* (vol. xxii., No. 1, 1914). The observations described are made at the Jamaica Astronomical Station of Harvard College Observatory, situated near Mandeville, at an altitude of 2100 ft., The instrument employed is an 11-in. Clark refractor, and the magnification generally used 660. Prof. Pickering states that the changes on Mars cannot be described as conspicuous except when the planet is viewed under very exceptional conditions, but in their general character they may be detected by careful study, even by those who are not fortunate enough to reside in those portions of the world where the seeing is habitually good. It is in order to emphasise this constant change, unlike changes seen on Jupiter, but resembling more those which occur on our earth, that Prof. Pickering proposed the issue of this monthly

bulletin. The present report describes as an introduction the general nature of the nomenclature to be used, and this is generally of a meteorological type, the observations being described under the four headings, snow, clouds, colours and shading, canals and lakes. The observations here dealt with cover the interval from July 27 to October 30, 1913.

A METEORITE FROM ZULULAND.—Prof. G. H. Stanley gives a very interesting description and analysis of a meteorite which fell in the N'Kandhla district of Zululand (*South African Journal of Science*, vol. x., No. 5, January, 1914). The meteorite was observed to fall on August 1, 1912. The first occurrence noted was the usual sound of an explosion, which attracted attention over a considerable area, and a rapidly moving body was seen which left a spiral trail of smoke and at the same time appeared to produce a rumbling or crackling sound. While possibly more than one was found, Prof. Stanley has only been able to locate one definitely, and this forms the subject of his communication. It fell near the junction of the Buffalo and Tugela Rivers, on the Pokinyoni hill in the N'Kandhla district, within a few yards of a native woman. The meteorite weighs nearly 38 lb., and consists almost entirely of nickel-iron alloy, and is therefore classed as a siderite; it is coated with a skin of magnetic oxide exhibiting flow lines, and shows also a profusion of "thumb marks." The communication is accompanied by numerous photographs of the specimen, and also several photographic sections. The complete analytical results are given in percentages as follows: iron, 89·28; nickel, 10·68; silicon, 0·004; sulphur, trace; carbon, 0·030; phosphorus, 0·057; traces of aluminium, magnesium, platinum, and chlorine. The presence of manganese, cobalt, or chromium could not be detected.

A SOLAR OBSERVATORY FOR NEW ZEALAND.—In our issue of July 3, 1913 (p. 460), we announced that Mr. Thomas Cawthron, of Nelson, New Zealand, had offered to build, equip, and endow a solar physics observatory in New Zealand. From a short article in the *Times* of March 23, we learn that Mr. Cawthron is prepared to give 50,000*l.* for this purpose. Mr. J. Evershed, director of the Kodaikanal Solar Observatory in India, who has visited New Zealand to advise as to the erection of the Cawthron Observatory, has spoken highly of the suitability of Nelson, from the geographical and climatological points of view, for the purpose of researches in solar physics.

THE INSTITUTE OF METALS.

THE spring meeting of the Institute of Metals was held in the building of the Institution of Mechanical Engineers on March 17 and 18. The afternoon of the first day was devoted to formal business and to the delivery of the presidential address by the newly elected president, Sir Henry J. Oram, Engineer-in-Chief of the Fleet. The morning and afternoon of the second day were devoted to the reading and discussion of reports and papers. The attendance of members at the meetings was unfortunately rather small, but a large number assembled for the annual dinner, which proved a particularly successful function.

The presidential address was chiefly devoted to the evolution of the Admiralty condenser tube, the various steps being described which have led to the present satisfactory position, in which the number of failures from either corrosion or splitting is as low as one in 60,099 per annum; the steps in question consisted mainly in the imposition of increasingly stringent conditions and tests, and in inducing manufacturers to work to these. Sir Henry Oram also directed attention to the steady decrease in the quantity of non-ferrous metals employed in warship machinery, steel taking the place of brass, bronze, and copper wherever possible. Such a state of affairs points to the need of vigorous progress in non-ferrous metallurgy in order that alloys may be produced which are capable of rendering services to which iron and steel are not applicable.

The nomenclature committee, appointed by the Institute of Metals, but including representatives of the principal technical societies and institutes in this country, presented its first report. The committee was appointed for the purpose of formulating, if possible, a rational system of nomenclature for alloys which should abolish the existing confusion. In its first report the general lines to be followed are laid down; these consist in the construction first of a "systematic nomenclature," in which every alloy is described by the names of its constituent metals, in English, arranged in ascending order of their numerical importance in regard to composition by weight. This logical but cumbersome system is not intended for ordinary daily use, and for this purposes a system of "practical" nomenclature is to be set up, the names comprised in this system being defined as simple verbal abbreviations of the terms of the systematic nomenclature.

The committee has so far presented definitions only of the terms "brass" and "bronze." Brass is defined as an abbreviation for the systematic term "zinc-copper," and therefore when used alone denotes an alloy consisting substantially of zinc and copper only, and containing more copper than zinc. If other metals are present in notable proportions, their names are to be prefixed, so that an alloy containing, say 1 per cent. of tin, would be called "tin-brass." Similarly the term "bronze" is defined as equivalent to "tin-copper." Dr. Rosenhain, as chairman of the committee, in presenting the report, claimed that an important step would be gained if the recommendations in regard to the terms "brass" and "bronze" were widely adopted, because much of the present confusion centred around those very terms; he therefore appealed for the steady support of all concerned on the ground that even if the system put forward by the committee were not the ideally best one, what was really essential was uniformity of nomenclature. In the discussion, Sir H. J. Oram, on behalf of the Admiralty, several important manufacturers and consultants, and some professors and teachers of metallurgy promised their cordial support of the committee's recommendations, so that the committee may approach its further task of defining other alloy names with considerable confidence in the ultimate success of its labours.

Dr. Desch, in his first report to the Beilby Prize Committee, presented a valuable and interesting summary of existing knowledge on the solidification of solids from the liquid state in particular reference to the freezing of metals and Quincke's "foam cell" hypothesis. The report contains a great quantity of information and a useful bibliography; Dr. Beilby commended the impartial and judicial attitude of the reporter, but Dr. Rosenhain likened it to a judge's summing-up, which must, ultimately, be followed by a sentence, and this was unlikely to be in favour of Quincke's hypothesis. Thanks to the further generosity of Dr. Beilby in providing the necessary funds, the committee is in a position to invite a further report on fresh experimental work from Dr. Desch.

A paper by Dr. J. E. Stead and Mr. Steadman, on the "Muntz metal" brasses, dealt with the effects of heat treatment. In this respect the paper was shown—in the discussion—to have been largely anticipated by the much earlier work of Bengough and Hudson,

but the paper gave rise to an interesting discussion. This dealt principally with a brass rod which had become disintegrated while in use as a floor-bolt in a high-tension electric power station. The bolt passes through the floor inside a procelain tube, and electrical leakage gives rise to the formation of nitric oxides in the air-space of the insulator tube. In the case described by Dr. Stead, and also in a similar one mentioned by Dr. Rosenhain in the discussion, the brass rod either had some minute cracks, due to slight hollow drawing, when first put in, or these were developed while the rod was in service. The nitric acid gases penetrated into these fissures and produced basic salts of zinc and copper which, by their increased volume, widened the cracks and ultimately led to the complete disruption of the rods. An initially sound, *annealed* brass rod suffers no such damage in the same conditions.

Other interesting papers, by Prof. A. Read and Mr. Greaves, on the influence of nickel on the alloys of aluminium and copper, by Mr. Dewrance on bronze, and by Messrs. Whyte and Desch on the microchemistry of corrosion, were read and fully discussed, the eminently successful meeting only terminating late in the afternoon.

AN EELWORM DISEASE OF RICE.

THE appearance of a rice-disease in eastern Bengal so serious that in certain districts the cultivators were in 1911 on the verge of ruin calls for special notice, since rice is, of all important cereals, the one perhaps least subject to serious disease. The matter is dealt with by Dr. E. J. Butler, mycologist to the Agricultural Research Institute at Pusa (Bihar), in a recent pamphlet (Bulletin No. 34, "Diseases of Rice"; Calcutta: Superintendent Government Printing, India, 1913).

The disease in question (called locally "ufra," from a word meaning "above," owing to a belief that atmospheric conditions are responsible for it) has existed long, but has only recently acquired such an intense form as to call for a special inquiry. From Dr. Butler's researches the active cause appears to be an eelworm, *Tylenchus angustus*, closely allied to the nematode which causes tulip-root in oats and other cereals. This Bengal worm, however, differs in its mode of attack from the Tylenchus of wheat and oats. It never enters the tissues of the rice-plant, but confines its ravages to epidemic organs wherever these are sufficiently soft and unsilicified to allow the entrance of the "spear" with which its mouth is armed. The inflorescence, the tissue above the nodes, and the growing point, are such weak places, and here the eelworm, both in mature and in larval stages, was abundantly found in all the plants exhibiting "ufra." The results of the attack of such large numbers of Tylenchus are discoloration of the stem and leaves, arrest of the inflorescence, sterility, and mouldiness. The extent of the damage is not accurately known, but in some districts is estimated to amount to half the normal crop.

This "ufra" disease is of a highly infectious quality. The eelworms swim through the submerged paddy-fields from one rice-plant to another, which they ascend and attack. Like their allies, these nematodes exhibit great powers of resistance to drought, but little to continued submergence; and hence it is somewhat difficult to account for their abundance in such flooded districts as the rice-growing lands in the Noakhali (eastern Bengal) district. Further investigations are needed on the bionomics of these parasites.

With regard to preventive measures, the only hopeful indication at present is the behaviour of transplanted rice in contrast to that of broadcast paddy. Dr. Butler shows that the former, though susceptible of attack by inoculation, is not attacked under ordinary conditions, and advocates an extension of the transplanted crop, the improvement of natural drainage, and the more systematic burning of the stubble. The importance of taking adequate prophylactic measures is seen in the geographical position of the infected area. On one side of it is the enormous paddy area of Bengal, on the other the Irrawaddy Delta, which supplies practically the whole of the export rice of India. "A serious disease of rice," says Dr. Butler, "is one of the greatest calamities that could befall the people" in the infected districts, "(where nearly three-quarters of the cultivated area is under paddy), for no other food crop can replace it."

METEOROLOGY IN NETHERLANDS' EAST INDIA.[1]

THE volume of observations before us contains the hourly readings made at the Batavia Observatory during the year 1910, which is the forty-fifth year of this uninterrupted series of hourly observations. Investigation of the upper air by balloons and kites has been regularly carried on, and important results were obtained. Several of the registering balloons attained heights exceeding 15 km. The number of ascents of pilot balloons amounted to 163; many were followed by means of theodolites to a height exceeding 10 km. The record height reached was 31 km. (on September 12, 1912).

The observations at secondary stations include (*a*) monthly and annual means of air-pressure reduced to the period 1866–1911. The influence of the high mountain range of Sumatra is shown in the deflections of the isobars in the direction parallel to the ridge; in the Indian Ocean, to the south-west of the island, there is a relative air-defect in the west monsoon, and an excess of pressure in the east monsoon. Dr. v. Bemmelen (director) also points out that in the west monsoon the isobars show a remarkable curvative over the sea between Borneo and Sumatra. (*b*) Sunshine observations 1909–11: the tables give distinct evidence of the way the cloudiness increases with height above sea-level, and that insolation is stronger during the east monsoon in East than in West Java. A further discussion of results is postponed until more data are available. (*c*) Observations of temperature and relative humidity at the agricultural station at Tjipetir, Java, 1906–11. Owing to deficiency of sunshine in the afternoon, the maximum temperature is shifted towards the morning hours.

With respect to the climate generally, Dr. van Bemmelen remarks that rainfall is the ruling factor in the archipelago, as other meteorological elements are almost constant; the average yearly rainfall at Batavia is a little more than 70 in. The study of changes of weather is of little practical importance, as these are trifling, while a storm-warning service is unnecessary, as cyclones do not pass over the area in question. Although it is at present considered unnecessary to construct daily weather charts, the director thinks it would be of great scientific interest if the conditions could be followed by means of synoptical grouping for either weekly or monthly periods. In connection with this view, mercury barometers have been supplied to several places; it is also proposed to establish meteorological stations on a few of the mountains possessing relief of simple form.

[1] (1) Observations made at the Royal Magnetical and Meteorological Observatory, vol. xxxiii. (2) Observations made at Secondary Stations vol. i.

EXPLORATION IN PERU.

THE Yale Peruvian Expedition of 1911 made a number of discoveries which, either for lack of time or means, could not at that time be given the attention they deserved. The most important of these the auspices of Yale University and the National Geographic Society, had for its chief objects the further study of these two discoveries and also the completion of certain topographical work planned for 1911, but not finished at that time.

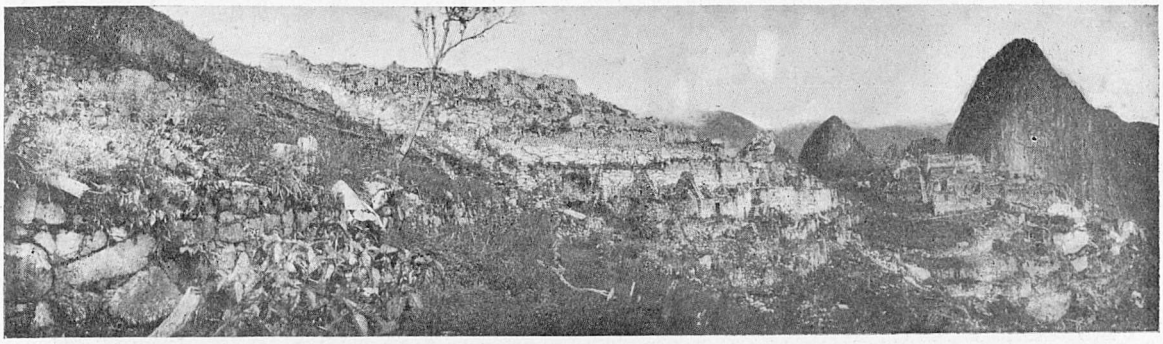

FIG. 1.—Machu Picchu. Sacred Plaza. Chief temple, east side, interior. Copyright by the National Geographic Society.

finds were the ruins of Machu Picchu, in the Grand Cañon of the Urubamba, below Ollantaytambo, and a small quantity of human bones apparently inter-

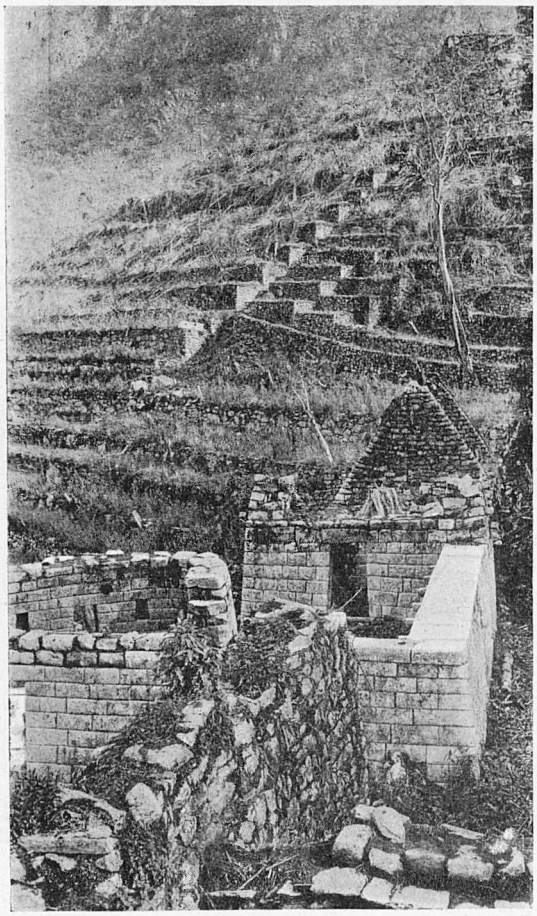

FIG. 2.—Machu Picchu. Princess group. View of round tower and ornamental wall. Shows in distance the agricultural terraces. Copyright by the National Geographic Society.

stratified with what seemed to be glacial gravel near the city of Cuzco.

The Peruvian Expedition of 1912, sent out under

The staff of the second expedition included, besides myself as director, Prof. H. E. Gregory, Silliman professor of geology in Yale University, geologist; Dr. G. F. Eaton, of the Peabody Museum of Yale University, osteologist; Mr. A. H. Bumstead, formerly of the United States Geological Survey, chief topographer; Messrs. K. C. Heald and R. Stephenson, assistant topographers; Mr. E. C. Erdis, archæological engineer; Dr. L. T. Nelson, surgeon; and Messrs. P. Bestor, O. Hardy, and J. P. Little, assistants.

The Cuzco Valley was carefully mapped by Mr. Bumstead and his assistants, and this map will be published in connection with the report on the geology of this valley now being prepared by Prof. Gregory. The geological work undertaken by Prof. Gregory consisted in part of a study of the gravel deposits near Cuzco, and the relation in age and position of these gravels to the remains discovered in 1911. The result of these researches has not confirmed us in the opinion that the human bones found in 1911 are of very great age. It seems probable, on the other hand, that, owing to recent filling and recutting of the valley, the bones may be of recent origin. Prof. Gregory also carried on a general examination of the structure and stratigraphy of the Cuzco Valley with a view of constructing a geological map of the area tributary to the Huatanay River. The region was found to consist chiefly of sedimentary rock of pre-Tertiary, Tertiary, and Pleistocene age. During glacial times a lake occupied the upper part of the valley.

Not far from Cuzco, in the Apurimac Valley, near Ayusbamba, a small amount of vetebrate fossil material was found and collected by Dr. Eaton. His report on these fossils, which include the remains of both ancient horse and deer, will be published in the *American Journal of Science*.

Anthropometric measurements were made of 145 Indian men in the department of Cuzco, and front and side view photographs were taken of each subject. The Indians represented sixteen provinces and sixty towns. Thirty-eight measurements were taken of each subject. Photographs of many Indian women were also taken in Cuzco and vicinity. The anthropological material collected by Dr. Nelson has been placed in the hands of Prof. H. B. Ferris, Hunt professor of anatomy in Yale University, who is preparing a report which will be published in the near future.

The ruins of Choqquequirau, which had been visited

by the present writer in 1909, were reached from the north side by Messrs. Heald, Eaton, and Nelson, of the expedition. A few boxes of bones and potsherds were collected. This party had great difficulty in carrying out its undertaking owing to the fact that no guides could be procured, and the way lay through a very rough country, where scarcity of water and a plague of flies were added to the many other difficulties.

Interesting but not highly important ruins were discovered by the writer near Palcay, in the Aobamba Valley, in the vicinity of an impressive group of glaciers hitherto unmapped and not reported. An interesting feature of one of the groups of ruins in this valley is that it appears to be exactly oriented; its two cross streets seem to run on the true, not on the magnetic, cardinal points.

The topographic cross section of the Andes along the 73rd meridian, begun by Mr. Kai Hendriksen in 1911, was completed in the face of great difficulties by Messrs. Bumstead, Hardy, and Little, and will be published in connection with the report of Prof. Isaiah Bowman, the geographer-geologist of the 1911 expedition.

The most interesting, and in many ways the most satisfactory, results of the 1912 expedition were in connection with the ruins of Machu Picchu. In 1911 the present writer, while engaged in a search for Vitcos, the last Inca capital, discovered a number of hitherto unreported groups of ruins in the valley of the Urubamba and its tributaries. The group known as Rosaspata, near Puquiura, in Vilcabamba, is believed to be that which the chroniclers called Vitcos, the capital where the young Inca Manco, set up by Pizarro, fortified himself after his revolt against the Spanish conquerors. But the ruins of Machu Picchu do not appear to have been connected with the later history of the Incas. These ruins are located on top of a ridge in the most inaccessible part of the Urubamba Cañon some 2000 ft. above the rapids, and some 8000 or 9000 ft. above sea-level.

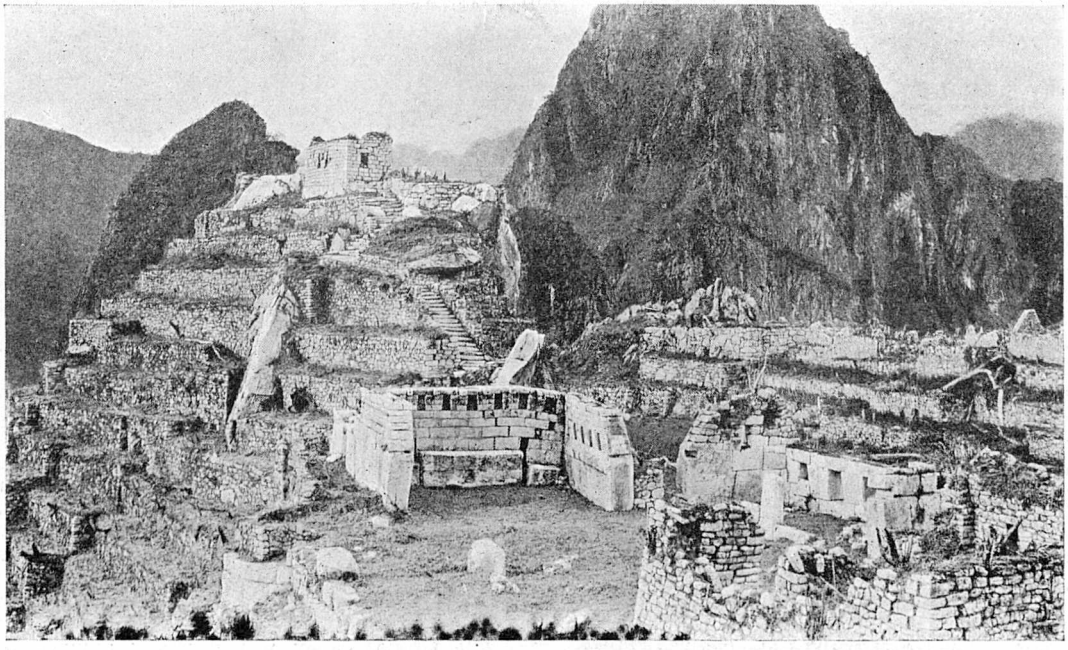

FIG. 3.—Machu Picchu. Sacred plaza and Intihuatana Hill from boulder caves. Copyright by the National Geographic Society.

The presence here, in a wonderfully picturesque position, of a remarkably large and well-preserved abandoned city practically untouched by the hands of the spoiler, and apparently unknown to the Spanish choniclers, led us to undertake to clear the city of its extensive jungles and to excavate the ruins. Many difficulties had to be overcome, but we were eventually successful in locating more than one hundred burial caves. The excavation yielded a considerable amount of anthropological material, including human and

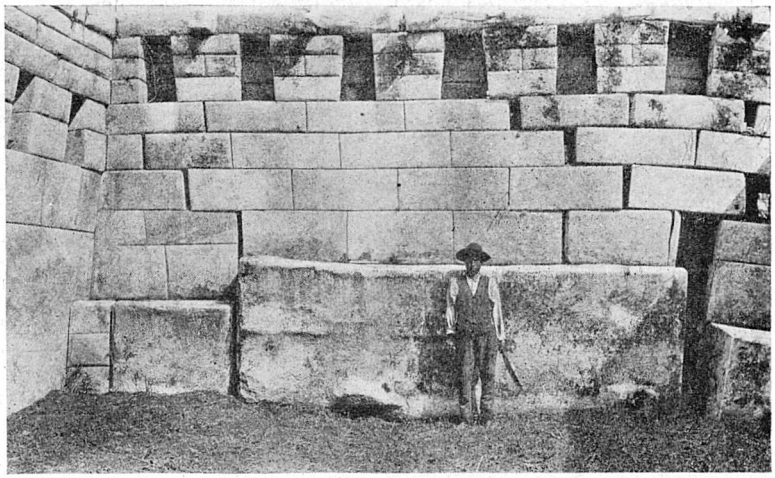

FIG. 4.—Machu Picchu. Sacred plaza. Chief temple, north wall, interior, showing the cracking caused by the settling of the east wall. Notice the care with which the size of the stones is made to decrease gradually in each ascending tier. The main altar stone is 14 ft. in length. Copyright by the National Geographic Society.

animal bones, a large number of potsherds and a few stone, silver, and bronze implements. Nothing of gold was found, and only half a dozen small silver pins and pendant discs.

The city itself contains about two hundred edifices. Most of the walls are standing and many of the terraces are in good repair. The roofs of the houses disappeared long since, and a large part of the city was completely overgrown with a tropical forest. Trees 2 ft. in diameter were found growing on top of the walls of the houses, and in some cases on the very peaks of the gables. A majority of the houses are of a storey and a half in height with gable ends.

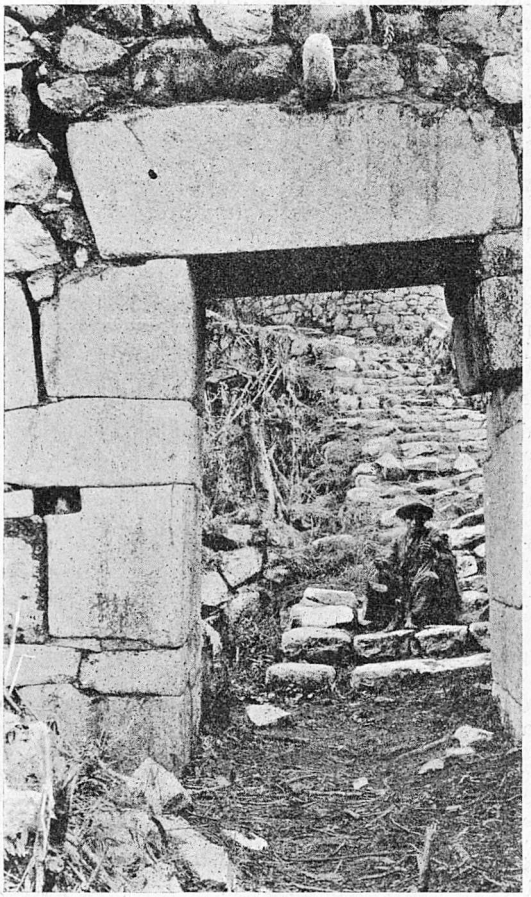

FIG. 5.—Machu Picchu. City gate, interior. Notice the lock hole containing granite cylinder on left and projecting ring stone over the lintel of the doorway. The gate, probably of wood, was either swung from the ring stone or fastened to it and balanced by a log fastened to the stone cylinders in the lock hole on either side of the gateway. A similar device was used also in the entrance doors to each isolated group of houses. Copyright by the National Geographic Society.

Perhaps the most conspicuous features of Machu Picchu are the number of stairways and the large number of windows in the houses. There are more than a hundred stairways, large and small, within the city. Some of them have more than 150 steps. In some cases the entire stairway of from six to ten steps was cut out of a single granite boulder. The water supply must always have been very scarce. We were there during the dry season, and with forty workmen found the available springs only barely sufficient for cooking and drinking purposes. The town may have had a population of two thousand people on occasion.

In the four months of field season, the ruins were practically cleared of all forest growth, and a large part of the débris was burned and removed. From twenty to forty workmen were kept continuously at work under the direction of Mr. Erdis.

One of the most interesting facts brought out as a result of the clearing was that the city was at one time divided into wards, or clan groups, each of which had but one entrance, a gateway furnished with the means of being solidly fastened on the inside. Each one of the clan groups has certain distinctive features, one having its own private gardens, another being distinguished by the ingenuity of the stone work, while still another is marked by having monolithic lintels over the doorways, and unusually steep gables. Machu Picchu contains examples of nearly every variety of architecture known to the Incas and their predecessors on the Peruvian highlands, including fine specimens of the most exquisite stone cutting that can be found anywhere in the New World. One of the most interesting structures is a temple containing three conspicuously large windows. Another is composed of several large blocks of granite, three of them being more than 12 ft. in length. These are shown in the accompanying photographs.

Machu Picchu is in a remarkably good state of preservation, and its architecture has not become confused by Spanish efforts to build churches and villas. The people who lived here were masters of the art of stone cutting. They know how to make bronzes, and they had considerable artistic sense. Their pottery is characteristically Inca in form and ornamentation, but some of the patterns and shapes are practically unknown in European museums.

Just where Machu Picchu comes in the history of the Incas is still a puzzle. It is too early to speak definitely. In many ways it appears to be closely related to Cuzco. One of the buildings bears a strong resemblance to the famous Temple of the Sun, now the Dominican Monastery. It is safe to say that Machu Picchu was essentially a city of refuge. There is no part of the Andes better defended by nature than this Grand Cañon of the Urubamba. Granite precipices, frequently more than 1000 ft. sheer, present difficulties of attack and facilities for defence which cannot be excelled. Furthermore, the natural defences were strengthened by the construction of high walls and a dry moat.

A careful survey of the ruins and the neighbouring cañon was made by Mr. Stephenson. More than seven hundred photographs of the ruins were taken by the writer, who has in hand the preparation of a complete report on the ruins and the material collected at Machu Picchu.

HIRAM BINGHAM.

CIVIL SERVICE ESTIMATES FOR SCIENCE AND EDUCATION.

THE Estimates for Civil Services for the year ending March 31, 1915, are being issued as a series of Parliamentary Papers. The following particulars referring to the money under this heading to be devoted to scientific work and to higher education are taken from the paper entitled, "Class IV.—Education, Science, and Art."

Under the heading, "Scientific Investigation, etc.," we find that the grants in aid for 1914–15 amount to 100,697*l.*, which represents a net decrease of 11*l.* on the amount voted in 1913–14.

The grants enumerated under the heading of the Royal Society amount for 1914–15 to 25,550*l.*, as compared with 27,150*l.* in 1913–14. This grant includes the usual 4000*l.* in aid of scientific investigation and 1000*l.* for scientific publications; the remainder of the amount is for the expenses of the Magnetic Ob-

servatory at Eskdalemuir, and for the National Physical Laboratory. For salaries and other expenses of the National Physical Laboratory the grant for 1914–15 is 7000*l.*, as compared with 12,000*l.* in 1913–14; but the grant for the Aeronautical Section of the National Physical Laboratory, which is given separate mention, is for 1914–15 12,550*l.*, as compared with 9150*l.* in 1913–14.

The following grants remain as they were in 1913–14:—Meteorological Office, 20,000*l.*; Royal Geographical Society, 1,250*l.*: Marine Biological Association of the United Kingdom, 1000*l.*; Royal Society of Edinburgh, 600*l.*; Scottish Meteorological Society, 100*l.*; Royal Zoological Society of Ireland, 500*l.*; Royal Scottish Geographical Society, 200*l.*; International Geodetic Association, 300*l.*; Solar Physics Observatory, 3000*l.*; North Sea Fisheries Investigation, 1250*l.*; International Seismic Association, 210*l.*

The grant to the Edinburgh Observatory is 1637*l.*, an increase of 89*l.* on 1913–14; and the British Antarctic Expedition receives 5000*l.* for the year 1914–15.

The grants in aid of the expenses of universities and university colleges amount for the year under consideration to 287,000*l.*, precisely the same sum as in the previous year.

The vote for science and art in Ireland reaches 145,164*l.*, as compared with 140,450*l.* in the previous year, a net increase of 4,714*l.* The estimate of the amount required for grants under the Irish University Act, 1908, is 124,000*l.*, a decrease of 1800*l.*

The estimate of the amount required to pay the salaries and expenses of the Board of Education and of the various establishments connected therewith is 14,730,621*l.*, a net increase of 70,552*l.* Among the items included in this large sum the following are of interest in this connection:—Technical institutions and evening schools, 638,000*l.*, an increase of 23,200*l.*; university institutions in respect of technological work, 48,000*l.*, an increase of 2000*l.*; Imperial College of Science and Technology, 30,000*l.*; Science Museum, 21,322*l.*, an increase of 2895*l.*; Geological Museum, 3925*l.*, an increase of 176*l.*; and the Geological Survey, 16,828*l.*, a decrease of 1047*l.*

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

GLASGOW.—The first award of the Kelvin gold medal and prize (founded by Lady Kelvin), for the best dissertation in natural philosophy presented for the degree of D.Sc. during the three years 1911–13, has been made to Dr. A. D. Ross, now professor in the University of Western Australia.

The first award of the William Jack prize (founded in honour of Emeritus Professor Jack), for the best dissertation in mathematics presented for the degree of D.Sc. during the four years 1910–13, has been made to Dr. R. J. T. Bell, senior University lecturer in mathematics.

LEEDS.—Mr. Aldred F. Barker, who has been head of the textile department of the Bradford Municipal Technical College for twenty years, has been appointed to succeed Mr. Roberts Beaumont as professor of textile industries. Mr. Barker is an old student of the University, having worked under Prof. J. Beaumont, the first occupant of the chair to which he now succeeds. He has had a considerable experience of actual mill work, and his publications are recognised as standard works on textiles.

Mr. Robert Cattley has been appointed honorary fellow in pathology, and Mr. Lionel Walmsley as honorary curator of the Marine Laboratory, Robin Hood's Bay.

MR. F. J. NORTH, assistant in the geological laboratory, King's College, London, has been appointed assistant keeper in the department of geology in the National Museum of Wales.

A COURSE of lectures on arts of East and West, by Laurence Binyon, will be given at the Battersea Polytechnic, London, S.W., on Wednesdays at 6 p.m., beginning May 6. The lectures are intended for advanced students; admission is free, and no ticket is required.

MR. PERCY COLEMAN, of the Northern Polytechnic Institute, Holloway, who has been appointed adviser in technical education and secretary to the National Board for Technical Education in the Union of South Africa, leaves for South Africa in the R.M.S. *Kinfauns Castle* on April 11.

A SUMMER School in Geography will be held on August 2–22 next at the University College of Wales, Aberystwyth. Prof. H. J. Fleure, lecturer in geography at the college, will give ten lectures on a regional survey of Europe, and eight on England and Wales. Mr. W. E. Whitehouse will give eight lectures on the teaching of geography by modern methods, five on the climate of the British Isles, and five on mathematical geography. In addition to the courses of lectures, practical work will be taken daily. Field classes will be held for practice in the use of simple survey instruments, while excursions will be made to places of interest, which afford material for the study of land sculpture, vegetation, and human facts.

WE learn from the *Times* that in accordance with a resolution passed at the joint meeting of the German and English sections of the King Edward VII. British-German Foundation, instituted by Sir Ernest Cassel, the German Foundation will again, in the year 1914–15, use part of its income in providing studentships to enable university graduates of British nationality to reside in Germany with the object of studying some branch of science or literature, or becoming acquainted with the commercial or industrial life of the country. The work of selection was even more difficult than last year, as the number of candidates was far larger, and most of them had obtained first-class honours in their universities. Studentships of the value of about 175*l.* were on March 21 awarded to Mr. B. Dickins, Magdalene College, Cambridge; Mr. R. A. Frazer, Pembroke College, Cambridge; Mr. S. W. Rawson, Queen's College, Oxford; Mr. G. G. Williams, Christ Church, Oxford; Mr. F. P. Wilson, Birmingham University and Oxford University; Mr. T. Wright, King's College, London University. Studentships of the value of about 100*l.* were awarded to Mr. A. B. Mayne, Balliol College, Oxford; Mr. J. S. Stephens, St. John's College, Cambridge.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, March 11.—Dr. A. Smith Woodward, president, and afterwards Dr. H. H. Bemrose, vice-president, in the chair.—E. T. **Newton**: A series of small mammalian and other remains from the rock-shelter of La Colombière, near Poncin (Ain). During the year 1913, Dr. Lucien Mayet and M. Jean Pissot were working systematically at the prolific deposits of this locality, and towards the end of the year made known the discovery of a number of incised bones and stones, representing the human form as well as several animals. The upper part of the deposit is referred to the Neolithic and Magdalenian ages; but

below this, at a depth of 6½ ft., a bed (10 in. thick) was found, which yielded the incised drawings above-mentioned, as well as numerous mammalian remains and flint-implements; and this is regarded as of Aurignacian age. Immediately below the last-mentioned bed a deposit of sand and small rock-fragments was penetrated to a depth of 10 ft., and this deposit, also referred to the Aurignacian, was found to contain an enormous number of bones of small mammals and other animals. Some twenty species have already been recognised by the discoverers.—Dr. A. Smith **Woodward**: An apparently Palæolithic engraving on a bone from Sherborne (Dorset). The author is indebted to Mr. R. Elliot Steel, of Sherborne School, for the opportunity of studying a fragment of bone bearing an incised drawing of the fore-part of a horse in the style of drawings already well known from several habitations of Palæolithic man. The specimen was found in an old mound of débris from a quarry in the Inferior Oolite near Sherborne. No associated specimens of any interest were recovered; but at the lower end of the same valley, about a quarter of a mile distant, teeth of mammoth and woolly rhinoceros have been found. Like the only other British specimen hitherto discovered—that described by Prof. Boyd Dawkins from the Creswell caves—the drawing is made on a fragment of rib; and the neck of the horse is fringed by fine lines, which indicate the short hog-mane usual in sketches made by the Palæolithic race.

Royal Astronomical Society, March 13.—Major E. H. Hills, president, in the chair.—Dr. F. W. **Dyson**: Greenwich determinations of the photographic magnitudes of stars brighter than 9·0 m. between declination +75° and the pole. The methods employed and the results obtained were described.—Dr. S. **Chapman**: The total light of the stars. His results showed that the total light of the stars was about equal to that which would be given by 630 stars of the first magnitude. The light given by stars of each magnitude somewhat increased down to the tenth magnitude, the greater number of stars compensating for the decrease of brightness of the individual stars. But below the tenth magnitude this was no longer the case, the light falling off more and more as we descend the scale.—Prof. J. W. **Nicholson**: The spectrum of hydrogen and helium.—H. H. **Turner**: Baxendell's observations of variable stars, edited by H. H. Turner and Miss Blagg. Difficulties had arisen through Baxendell's various ways of naming the stars, but a more serious matter was that there were so many unfortunate gaps in the series of observations. Comparison with the Rousdon observations showed discrepancies, which might be attributed to the attempt to estimate the maximum—always an extremely difficult matter.

Physical Society, March 13.—Dr. A. Russell, vice-president, in the chair.—Dr. C. **Chree**: Time measurements of magnetic disturbances and their interpretation. The paper is a sequel to one read in November, 1910, dealing with the times of commencement of fifteen magnetic disturbances discussed by Mr. R. L. Faris, and supposed by him to support Dr. L. A. Bauer's theory that the commencing movements of magnetic storms travel round the globe at rates of the order of 100 km. a second. The author suggested then that, for an adequate test of Dr. Bauer's theory, data could only be obtained from a number of stations encircling the earth. Shortly afterwards Dr. Bauer issued a circular requesting magnetic observatories to send him their measurements of the times of commencement of the fifteen magnetic storms. Upwards of thirty stations sent in data. A discussion of the data derived from the horizontal force curves has been published by Dr. Angenheister, whose conclusions are unfavourable to Dr. Bauer's theory. The present paper deals with the data from the declination and vertical force curves as well as those from the horizontal force curves. The bearing of the data on Dr. Bauer's theory is discussed.—H. N. **Mercer**: The ratio of the specific heats of air, hydrogen, carbon dioxide, and nitrous oxide. The object of the experiments was to test the accuracy with which γ could be measured, employing small quantities of the gas, with the view of experiments on the variation of γ with temperature. The method employed was to observe with a platinum thermometer of very fine wire the instantaneous fall of temperature corresponding to a given rapid fall of pressure. The apparatus employed was similar to that used by Makower, but it was found that with due precautions an equal degree of accuracy was obtainable with a vessel of only 300 c.c. capacity. A table is given showing the values of the specific heat at constant pressure for the various gases as calculated from the present experiments. The values show good agreement with direct calorimetric determinations.—A. J. **Philpot**: The asymmetric distribution of the secondary electronic radiation produced by X-radiation. Prof. S. P. **Thompson**: A lecture experiment on the irrationality of dispersion. Newton's method of crossed prisms throws an oblique spectrum on the wall. If the prisms used are of identical kinds of glass the oblique spectrum is straight from red to violet; but if different kinds of glass are used, the spectrum is curved by reason of irrationality of dispersion. If a diffraction grating is used instead of one of the prisms, then the curvature observed is that resulting from the irrationality of dispersion of the particular prism employed. To exhibit these effects in the lecture theatre a diffraction grating of 12,000 lines to the inch is employed to cast a horizontal spectrum of the first order, the light from an arc lamp being sent through a small hole. On interposing a prism to disperse the light vertically upwards, the resultant oblique spectrum is finely curved, being concave upwards.

Zoological Society, March 17.—Prof. E. A. Minchin, vice-president, in the chair.—L. N. G. **Ramsay**: (1) The annelids of the family Nereidæ, collected by Mr. F. A. Potts in the N.E. Pacific in 1911, with a note on Micronereis as a representative of the ancestral type of the Nereidæ. (2) The genera Ceratocephale, Malmgren, and Tylorrhynchus, Grube.—A. Kynvett **Totton**: The structure and development of the caudal skeleton of the Teleostean fish, *Pleuragramma antarcticum*.—G. C. **Robson**: Report on Mollusca from Dutch New Guinea collected by the British Ornithologists' Union and Wollaston Expeditions. In general, the collection appears to endorse Hedley's views as to the Oriental affinities of the Papuan molluscan fauna. Though numerically small in species and individuals, the collection has yielded two genera and three new species, the anatomy of all of which is described.—P. R. **Awati**: The mechanism of suction in *Lygus pabulinus*, Linn. This is a Capsid bug injurious to the foliage of the potato, on which it feeds. A detailed description of the morphology and anatomy of those organs of the head concerned in sucking the plant-juices is followed by an account of their mode of action, in part deduced from their structure and arrangement, in part derived from observation of the living insect.—K. G. **Blair**: Report on the Heteromerous Coleoptera collected by the British Ornithologists' Union and the Wollaston Expeditions in Dutch New Guinea. The most interesting feature of the collection, from the point of view of distribution, is the occurrence of *Cissites maxillosa*, Fab., in this region. This beetle has been hitherto regarded as peculiar to the Oriental region, its range extending from Assam to Java, Borneo, and the Philippine

Islands; it has also been found in Ceylon.—R. **Lydekker**: The Malay race of the Indian elephant. The author made the young Negri Sembilan elephant, formerly living in the society's gardens, the type of a new race, *Elephas maximus hirsutus*, subsp. n., characterised by the square, instead of triangular, form of the ear, the early date at which its upper margin is bent over, and the presence in the young condition—at least, in some cases—of a thick coat of black and in part bristly hair.—Prof. W. J. **Dakin**: The fauna of Western Australia: (1) the Onychophora, (2) the Phyllopoda.

Mineralogical Society, March 17.—Dr. A. E. H. Tutton, president, in the chair.—F. P. **Mennell**: An occurrence of bornite nodules in shale from Mashonaland. The ore-body of the Umkondo mine in south-east Mashonaland consists of a bed of shale through which are scattered nodules of bornite, most probably pseudomorphous after concretionary pyrites. The enclosing rocks are of the same age as the Waterberg series of the Transvaal, and contain pseudomorphs after salt in some of the shale bands. The occurrence of copper and salt at nearly the same horizon is paralleled in the Lower Keuper beds of Europe.—A. **Scott**: Augite from Bail Hill, Dumfriesshire. It occurs in crystals, which are black in colour, but yellowish-green in thin sections, and of two types, simple and twinned, and have the axial constants $a:b:c=0{\cdot}5844:1:1{\cdot}0932$, $\beta=105°\ 48'$, and refractive indices 1·708, 1·713, 1·728. Sections parallel to the plane of symmetry show the hour-glass structure characteristic of titaniferous augite.—Dr. G. T. **Prior**: A sulph-arsenite of lead from the Binnenthal. Analysis of the crystals, on which the prism zone alone was developed, showed that the composition corresponded to the formula, $3PbS.2As_2S_3$, which is that attributed to rathite; crystallographically, however, the crystals seem nearer to dufrenoysite.—Dr. G. T. **Prior**: Phacolite and gmelinite from co. Antrim. In both instances analyses of these minerals, which are varieties of the same species, differing in habit of crystal, showed an excess of hydrated silica over the composition represented by the formula, $(Ca,Na_2)Al_2Si_4O_{12}.6H_2O$.

Royal Meteorological Society, March 18.—Mr. C. J. P. Cave, president, in the chair.—Prof. A. C. **Seward**: Climate as tested by fossil plants. The difficulty of using fossil plants as tests of climate becomes increasingly great in proportion to the degree of difference between the extinct types and their nearest living relations. It is from the examination of petrified plants, the delicate tissues of which are almost perfectly preserved, that data may be obtained throwing light on climatic conditions. This method of inquiry is best illustrated by a consideration of some of the anatomical features of the leaves, stems, and roots of trees which grew in the forests of the Coal period; the form and arrangement of cells in the leaves indicate fairly bright sunlight; large spaces in the cortex of roots point to growth in swamps. The geographical distribution of plants during the latter part of the Palæozoic era affords evidence of the existence of two botanical provinces, a northern province characterised by a luxuriant flora living under conditions more genial than those to which the poorer flora of the southern hemisphere was exposed. The presence or absence of rings of growth in the petrified stems of plants may afford evidence of the occurrence or absence of seasonal changes. A general survey of the Jurassic flora of the world leads to the conclusion that the climate was comparatively uniform, and in Arctic and Antarctic regions much more genial than at the present day. The fossil floras of more recent geological periods furnish clear evidence of subtropical conditions in Europe; in later times the occurrence of northern types in Britain heralds the approach of the Glacial period, and in post-Glacial beds are found fragmentary remains of immigrants from neighbouring floras which have largely contributed to our present flora.

PARIS.

Academy of Sciences, March 9.—M. P. Appell in the chair.—H. **Deslandres** and A. **Perot**: The design of an electromagnet capable of giving a magnetic field of 100,000 gauss. The limits of the magnetic field are imposed by the saturation of the iron and the heating of the bobbins. By a special method of cooling the bobbins and modifying their position with respect to the iron core the authors have already obtained a field of 51,500 gauss. For the proposed magnet, keeping the same concentration of ampere-turns, the copper used is to be pure, and strongly cooled petrol to be utilised to carry away the heat generated in the coil. On account of the large consumption of electrical energy it will be necessary to set up the magnet close to a large generating station to reduce the cost of the current.—G. **Gouy**: The action of gravity on gaseous mixtures, notably in the terrestrial atmosphere. From a mathematical investigation it is concluded that the action of gravity on the composition of air is too slow to produce sensible effects except in the inaccessible region where the pressure is comparable with that in a Crookes tube.—Paul **Sabatier** and Léo **Espil**: The reduction of nickel protoxide and the existence of a sub-oxide. The reduction of oxide of nickel NiO by hydrogen has been studied at varying temperatures, the reaction being followed by weighing the water formed. Reduction is more readily effected on an oxide which has been formed at a low than at a high temperature, and an increase in the velocity of the current of hydrogen also increases the reduction. The velocity of reduction is an exponential function of the temperature. There are indications of the formation of a sub-oxide, Ni_4O; this is also reduced but at a slower rate than the original NiO.—P. E. **Gau**: General transformations of differential systems.—G. **Armellini**: The general theorem on the problem of n bodies.—Victor **Vâlcovici**: Hydrodynamic resistance in non-uniform movement.—Charles **Rabut**: The calculation of the forces developed by the contraction of cement in armoured concrete.—Th. De **Donder**: The kinematic interpretation of Poynting's theorem.—Louis **Benoist** and Hippolyte **Copaux**: The application of the laws of transparency of matter to the X-rays to the determination of some contested atomic weights. Cases of thorium and cerium. From the opacity to the X-rays the values 232 and 140 are found to be the most probable atomic weights for thorium and cerium respectively.—Georges **Claude**: The light yield of neon tubes as a function of their diameter.—B. **Szilard**: A radium lightning conductor. A small disc carrying a radium preparation is placed beneath the point of the conductor. The electrical effects observed with this in air are described.—H. **Parodi**: An arrangement of rings or brushes capable of replacing the collector in dynamos.—E. **Rothé** and R. **Clarté**: The influence of the state of the atmosphere on the propagation and reception of hertzian waves.—Mme. N. **Demassieux**: Study of the equilibrium between the chlorides of lead and sodium in aqueous solution.—Léon **Guillet**: The alloys of copper, nickel, and aluminium. Measurements of the elastic limit, breaking strain, hardness, and resilience of three sets of alloys containing 60, 83, and 90 per cent. of copper, and varying proportions of nickel and aluminium.—R. **Lespieau**: Passage from the dimethyl ethers of the acetylene glycols to the glycols.—E. E. **Blaise**: The formation of rings from the 1:4 diketones.—H. **Gault**: Oxalacetic ester.

—Georges **Dupont**: The stereochemical isomers of some γ-glycols.—Paul **Brenans**: Iodine compounds obtained from orthonitroaniline and orthonitrosulphanilic acid.—Const. A. **Ktenas**: Metamorphic phenomena at the island of Sériphos.—C. **Gaudefroy**: The dehydration figures of potassium ferrocyanide.—Louis **Matruchot**: Progressive cultural variations of *Tricholoma nudum*.—J. M. **Lahy**: The objective signs of fatigue in professions not requiring muscular effort. The variations in the blood pressure and reaction time were found to give useful indications of this class of fatigue.—Louis **Lapicque**: The economy in food realisable by raising the external temperature. A discussion of a recent note on this subject by Miramond de Laroquette.—E. **Voisenet**: New researches on a ferment contained in waters, the dehydrating agent of glycerol.—G. de **Gironcourt**: The milk ferments in the Touareg.—Paul **Bertrand**: Relations of the imprints of Corynepteris with Zygopteris.—E. **Bénévent**: Glacial action.—Ph. **Flajolet**: Observations made at the Lyons Observatory during the hurricane of February 22, 1914.—E. A. **Martel**: The Beatus-Höhle (Switzerland) and underground water of limestones.—De Montessus de **Ballore**: Luminous phenomena accompanying the earthquake at Rauhe Alb, November 16, 1911.

March 16.—M. P. Appell in the chair.—Ch. **Lallemand**: The twenty-four hours dial. For telegrams and railway time-tables numbering the hours from 0 to 24 has distinct advantages. In the author's opinion there is no advantage, however, in dividing the clock dial into twenty-four hours instead of the usual twelve.—A. **Haller** and Jean **Louvrier**: Syntheses by means of sodium amide. Preparation of some of the higher homologues of mono- and di-methyl camphors, as well as the corresponding camphols. The sodium amide method has been applied to the preparation of ethyl- and diethyl-camphor, methylethylcamphor, propyl- and dipropyl-camphor, benzyl- and dibenzyl-camphor and ethylbenzylcamphor. All these have been reduced to the corresponding camphols, the properties of which are described.—Paul **Sabatier** and M. **Murat**: The direct hydrogenation by catalysis of the diaryl ketones and the aryl alcohols. The preparation of polyaryl alcohols. Benzophenone is reduced by hydrogen in presence of nickel to diphenylmethane; with a more active nickel the reduction can be carried to di*cyclo*hexylmethane. The reaction, which is a general one, is shown to hold for the higher homologues of benzophenone.—Charles **Richet**: Hereditary tolerance of toxic substances in the lower organisms. The lactic acid ferment was grown in presence of toxic substances (potassium arseniate, phosphate, seleniate, nitrate), and after several successive cultures was found to acquire a resistance to the action of the toxic body present.—A. **Laveran** and G. **Franchini**: The infection of mice by means of the flagellæ of the rat flea by the digestive tract.—C. **Guichard**: Asymptotic networks and congruences.—J. **Guillaume**: Observation of the partial eclipse of the moon on March 11, 1914, made at the Lyons Observatory.—F. **Courty**: Observation of the eclipse of the moon of March 12, 1914, at the Bordeaux-Floirac Observatory.—Henry **Bourget**: Observation on the same made at Marseilles.—W. **Blaschke**: The evaluation of double integrals of convex functions.—R. **Jentzsch**: The extension of a theorem of Laguerre.—Henri **Frossard**: The whispering voice and in general the flow of a fluid under pressure in a capsulism going from zero to infinity.—Léon and Eugène **Bloch**: The spark spectra of nickel and cobalt in the extreme ultra-violet. Measurements are given for wave-lengths between 2100 and 1850.—J. de **Kowalski**: The different spectra of mercury, cadmium, and zinc. The metallic vapours were examined at different pressures, governed by the temperature of a piece of metal in a subsidiary quartz bulb. The discharge was produced without electrodes, by surrounding the quartz bulb containing the vapour with several turns of copper wire carrying a high-frequency current. The lines observed varied with the vapour pressure of the metal.—Jean **Timmermans**: Pure propane: the weight of a normal litre. Two sets of density measurements were made, the gas in the first set being prepared by Lebeau's method from propyl iodide and sodium amide, and in the second set by the reduction of propionitrile by sodium. The final purification in both cases was effected by fractional distillation. The mean result (seventeen observations) was 2·01955 grams per litre.—J. **Bancelin**: The absolute measurement of adsorption coefficients. The adsorption was studied on known areas of glass plates, and results are given showing the quantities adsorbed in grams per sq. cm. at different concentrations of the solution.—Eugène Louis **Dupuy**: The magnetic susceptibility of some feebly magnetic alloys. Alloys of silver and antimony, lead and tin, and zinc and aluminium were studied, and the results given graphically, the magnetic susceptibilities being taken as ordinates and percentage composition as abscissæ.—A. **Colani**: Ferrous and chromous metaphosphates.—Marcel **Dubard**: The relations of the principal genera of Mimusopeæ between themselves and with the Sideroxyleæ.—J. **Beauverie**: The chondriome of the Basidiomycetes.—G. **Kimpflin**: The laws of physical growth during childhood and adolescence. A continuous study of 200 children from the age of eleven to sixteen years. Relations between the height, weight, and thoracic perimeter.—L. and M. **Lapicque** and R. **Legendre**: Change in the excitability of nerves caused by an alteration in their myeline sheath. The action upon the nerve of the frog of chloroform, ether, cocaine, strychnine, sodium oxalate, solanine, and morphine is detailed.—A. **Magnan**: The characteristics of the marine birds.—Louis **Léger**: A parasite of the trout, belonging to genus Dermocystidium.—Edgard **Herouard**: Pædogenesic pæcilogony in *Chrysaora isoceles*.—Adrian **Lucet**: Researches on the evolution of *Hypoderma bovis* and the means of destroying it.—J. **Deprat**: The presence of the marine Rhætian with coal, on the western border of the delta of the Red River, Tonkin.—Paul **Fallot**: The stratigraphy of the Sierra of Majorca.—Ph. **Flajolet**: Perturbations of the magnetic declination at the Lyons Observatory (Saint-Genis-Laval) during the fourth quarter of 1913.

BOOKS RECEIVED.

The Marine Biological Station at Port Erin (Isle of Man), being the Twenty-seventh Annual Report of the Liverpool Marine Biology Committee. Pp. 70. (Liverpool: C. Tinling and Co., Ltd.)

Was Wir Ernst Haeckel Verdanken. Edited by H. Schmidt. Band i. Pp. xv+432. Band ii. Pp. viii+416. (Leipzig: Verlag Unesma G.M.B.H.) 2 vols., 8 marks.

Union of South Africa. Annual Report of the Department of Agriculture for the Period 1912–13 (Agricultural Education). Pp. 184. (Cape Town: *Cape Times*, Ltd.) 4*s*.

Ricerche Sperimentali Sui Raggi Magnetici in Diversi Gas e Miscugli Gassosi. By Prof. A. Righi. Pp. 36. (Bologna: Gamberiori e Panmeggiani.)

Wild Flowers as They Grow. Photographed in Colour Direct from Nature. By H. E. Corke. With descriptive text by G. C. Nuttall. Sixth series. Pp. viii+200+plates. (London: Cassell and Co., Ltd.) 5*s*. net.

Technical Mechanics: Statics and Dynamics. By

Prof. E. R. Maurer. Third edition. Pp. vii+356. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 10s. 6d. net.

Laboratory Manual, Direct and Alternating Current, Prepared to Accompany Timbie's Elements of Electricity. By C. E. Clewell. Pp. vi+100. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 4s. 6d. net.

Boden-Bakterien und Boden-Fruchtbarkeit. By Dr. F. Löhnis. Pp. vi+70. (Berlin: Gebrüder Borntraeger.) 1.20 marks.

La Silice et les Silicates. By H. le Chatelier. Pp. 574. (Paris: A. Hermann et Fils.) 15 francs.

A History of British Mammals. By G. E. H. Barrett-Hamilton. Part xv. (London: Gurney and Jackson.) 2s. 6d. net.

Sounds and Signs. By A. Wilde. Pp. 180. (London: Constable and Co., Ltd.) 4s. 6d. net.

The Currents in the Gulf of St. Lawrence. By Dr. W. Bell Dawson. Pp. 46+map. (Ottawa: Department of Naval Service.)

Kaiserliche Marine. Deutsche Seewarte. Aus dem Archiv der Deutschen Seewarte. xxxvi. Jahrgang 1913. Nr. 3. Die Temperaturschwankungen 1870–1910 in ihrem Verhaltnis zu der II jährigen Sonnenfleckenperiode. By J. Mielke. Pp. 63. (Hamburg.)

Igneous Rocks and their Origin. By Prof. R. A. Daly. Pp. xxii+563. (New York: McGraw-Hill Book Co., Inc.; London: Hill Publishing Co., Ltd.) 17s. net.

DIARY OF SOCIETIES.

THURSDAY, MARCH 26.

ROYAL SOCIETY, at 4.30.—The Nature of the Tubes in Marsupial Enamel and its Bearing upon Enamel Development: J. H. Mummery.—Oxidation of Thiosulphate by Certain Bacteria in Pure Culture: W. T. Lockett.—The Production of Anthocyanins and Anthocyanidins: A. E. Everest.—Variations in the Growth of Adult Mammalian Tissue in Autogenous and Homogeneous Plasma: A. J. Walton.—(1) The Decomposition of Formates by *B. coli communis*; (2) The Enzymes which are Concerned in the Decomposition of Glucose and Mannitol by *B. coli communis*: E. C. Grey.—Description of a Strain of *Trypanosoma brucei* from Zululand. I: Morphology. II: Susceptibility of Animals: Surg.-General Sir D. Bruce, Major A. E. Hamerton, Captain D. P. Watson, and Lady Bruce.

ROYAL INSTITUTION, at 3.—The Progress of Modern Eugenics. I: The First Decade, 1904–1914: Dr. C. W. Saleeby.

CONCRETE INSTITUTE, at 7.30.—*Discussion*: Calculations and Details of Steel-frame Buildings from the Draughtsman's Standpoint: W. C. Cocking.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8. Current Limiting Reactances on Large Power Systems: K. M. Faye-Hansen and J. S. Peck.

INSTITUTE OF CHEMISTRY, at 8.—Explosives: W. Macnab.

SOCIETY OF DYERS AND COLOURISTS, at 8.—Illumination in Connection with the Textile Industries: L. Gaster.—Further Note on the Estimation of Prussian Blue in Textile Fabrics: H. E. Williams and W. P. Dreaper.

FRIDAY, MARCH 27.

ROYAL INSTITUTION, at 9.—Improvements in Long Distance Telephony: Prof. J. A. Fleming.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Harmonigraph as Applied to Advertising: A. Forbes.

FARADAY SOCIETY, at 5.—Discussion on Optical Rotatory Power.—Introductory Address: Prof. H. E. Armstrong.—Some Contributions to the Knowledge of the Influence of Certain Groups on Rotatory Power: Prof. H. Rupe.—New Studies in the Rotatory Dispersion of Tartaric Acid and Malic Acid: Prof. H. Grossman.—The Existence of Racemic Tartaric Acid in Solution: Dr. E. Darmois.—Anomalous Rotatory Dispersion: Prof. L. Tschugaeff.—Normal and Anomalous Rotatory Dispersion: Dr. T. M. Lowry and T. W. Dickson. At 8.15.—An Enclosed Cadmium Arc for Use with Polarimeter: Dr. T. M. Lowry and H. H. Abram.—The Relations between the Rotatory Powers of the Members of Homologous Series: Dr. R. H. Pickard and J. Kenyon.—The General Behaviour of Optically Active Compounds as Regards the Dependence of Rotation on Temperature Dilution, Nature of Solvent, and Wave Length of Light: Dr. T. S. Patterson.

PHYSICAL SOCIETY, at 5.—A New Type of Thermogalvanometer: F. W. Jordan.—An Instrument for Recording Pressure Variations due to Explosions in Tubes: J. D. Morgan.—The Direct Measurement of the Naperian Base: R. Appleyard.—An Experiment with an Incandescent Lamp: C. W. S. Crawley.

SATURDAY, MARCH 28.

ROYAL INSTITUTION, at 3.—Recent Discoveries in Physical Science: Sir J. J. Thomson.

ESSEX FIELD CLUB (at the Essex Museum, Romford Road, Stratford), at 6.—Some Notes on Essex Geology at the Close of the Nineteenth Century and After: W. Whitaker.—Wasps and their Ways: C. Nicholson.

MONDAY, MARCH 30.

ROYAL SOCIETY OF ARTS, at 8.—Surface Combustion: Prof. W. A. Bone.

INSTITUTE OF ACTUARIES, at 5.—The Treatment of the Depreciation in Assets due to an Enhanced Rate of Interest: R. R. Tilt.

TUESDAY, MARCH 31.

ROYAL INSTITUTION, at 3.—Landscape and Natural Objects in Classical Art: Later Greece and Rome: A. H. Smith.

ROYAL SOCIETY OF ARTS, at 4.30.—The Oil Resources of the Empire: D. F. Mollwo Perkin.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Further Discussion*: Some Recent Developments in Commercial Motor-vehicles: T. Clarkson.—Comparative Economics of Tramways and Railless Electric Traction: T. G. Gribble.

WEDNESDAY, APRIL 1.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Damage Caused to Vegetation by Sulphrous and Sulphuric Acids in the Atmosphere: R. R. Tatlock and R. T. Thomson.—Abnormal Refraction of Milk Serum: Dr. J. McCrae.—Water of Dorton Spa: C. A. Mitchell.

AERONAUTICAL SOCIETY, at 8.30.—Aeroplanes. G. de Haviland.

ROYAL SOCIETY OF ARTS, at 8.—Sarawak: Her Highness The Ranee of Sarawak.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, APRIL 2.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture: Series Lines in Spark Spectra: Prof. A. Fowler.

ROYAL INSTITUTION, at 3.—The Progress of Modern Eugenics. II. Eugenics To-day: Its Counterfeits, Powers, and Problems: Dr. C. W. Saleeby.

CHILD STUDY SOCIETY, at 7.30.—The Nervous Child: Dr. L. Guthrie.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Signalling of a Rapid Transit Railway: H. G. Brown.

FRIDAY, APRIL 3.

ROYAL INSTITUTION, at 9.—Further Researches on Positive Rays: Sir J. J Thomson.

INSTITUTION OF CIVIL ENGINEERS at 8.—East Stirlingshire Waterworks, and a Note on Earthen Embankments: O. I. Bell.

SATURDAY, APRIL 4.

ROYAL INSTITUTION, at 3.—Recent Discoveries in Physical Science: Sir J. J. Thomson.

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