THURSDAY, MARCH 21, 1912.

AN ENGLISH PHYSIOLOGIST.

Sir John Burdon-Sanderson: a Memoir by the late Lady Burdon-Sanderson. Completed and edited by his Nephew and Niece. With a selection from his papers and addresses. Pp. 315. (Oxford: Clarendon Press, 1911.) Price 10*s.* 6*d.* net.

SIR JOHN BURDON-SANDERSON belonged to that golden age of natural science, the second half of the nineteenth century. Born at the close of the year 1828, he was privileged to share in, and gifted to profit by, the wealth of discovery and conception which enriched biological knowledge from 1850 to 1880. There are many notable names in this period, Bernard, Helmholtz, Ludwig, du Bois-Reymond, Darwin, Huxley, Hooker, Pasteur, and Lister; and among these Burdon-Sanderson takes an honoured place; it is therefore fitting that some record should exist of his life and work. In his speech at Edinburgh Pasteur, in 1884, recalled with enthusiasm Robert Flint's exhortation to "remember the past and look to the future," and impressed on the students whom he was addressing the advice to "associate the cult for great men and great things with every thought." The present memoir, begun by the late Lady Burdon-Sanderson, and completed by Dr. J. S. Haldane and Miss Haldane, is a laudable effort towards the fostering of this cult. It deals with one who was intimately associated with the rise of modern English physiology, and is justly regarded as the founder of scientific pathology in this country.

In physiology Sanderson was not only an exact investigator, but the upholder of sound experimental methods; indeed, he extended these to the teaching of the subject, thus changing the character of such teaching from the didactic to the experimental type. In pathology his influence was still more potent, as he was the first to undertake for sanitary purposes the carrying out of pathological investigations along strictly scientific lines and by rigorously exact methods; it is not too much to say that the great developments of pathological and sanitary science which have taken place in England were started by his investigations and his influence.

All this is set forth in the memoir, which must therefore be of special interest to the scientific reader. In the early chapters a pleasant and graphic account is given of Sanderson's youth, education, and early scientific training. This part was written by Lady Burdon-Sanderson, and is full of interest; it is simply set forth, but as it was evidently a labour of love it gains in force by its very simplicity, particularly when, as frequently happens, vivid touches reveal some striking traits of Sanderson's personality. If the test of effective biography be its power to create in the mind of the reader a picture of the kind of man who forms the subject of the biographer, then, as far as they go, these early chapters will endure this test. Nor is such presentation unimportant, for, like many notable men, Sanderson was pre-eminently a personality It was his impressive character which gave him such influence over others, and which, when taken in connection with his gifts and scientific achievements, became almost overwhelming. He was one of the world's gifted sons, but in addition he was essentially a sympathetic intellectual. This was realised not only from his speech and manner, but from his face and form, so that the value of his approval or criticism was greatly enhanced through his personality and bearing.

The chapters which, as mentioned above, describe his family circle and his development bring before the reader this personality, and the necessity for a rational basis of conception, combined with the display of sympathetic toleration and interest, is here displayed as the keystone of his temperament.

The later chapters which describe his scientific career in London, and later in Oxford, are not so happy as regards their setting. The narrative is somewhat broken up through the introduction of written statements and extracts from obituary notices, so that the effect of the whole is impaired. The quotations from the numerous documents sent to Lady Burdon-Sanderson for the purpose of the memoir, deal in some cases with similar aspects of Sanderson's life and work, and in this way there is considerable overlapping, with its resulting diminution of interest. No doubt it was a task of some difficulty to piece together the fragments left by Lady Burdon-Sanderson and, in doing so, to mould the whole into a continuous and effective narrative. It is to be feared, therefore, that Sanderson's scientific achievements, extending as they do over a rather large biological field, will be scarcely appreciated by many readers. The importance of his discoveries in electrobiology, of his modifications in physiological teaching, of his epoch-making reports to the Privy Council on tuberculosis and allied subjects, and of his work at Oxford as the real founder of her medical school, is not so manifest as it might have been owing to the arrangement of this part of the memoir. But the account is in itself fairly complete, and it is emphasised by appending to the memoir a selected number of addresses given

by Sanderson on various occasions. These add to the value of the whole book, since they afford a ready means of appreciating Burdon-Sanderson's intellectual point of view in relation to biological problems.

The last chapter of the memoir gains in interest because it is devoted to the consideration of his personal characteristics and opinions. Such consideration is the salt of most biographical writings, and derives the chief part of its piquancy from the necessary introduction of the biographer's own view as to the nature of the opinions held by the subject of his account. It need scarcely be said that the essence of the piquant interest is the circumstance that the biographer now treads on ground which is open to criticism.

The present memoir offers, in its last chapter, a fair mark for comment when it implies that Burdon-Sanderson came to regard biological phenomena from what in these days would be called the "neo-vitalistic" point of view. The writings of a sympathetic intellectual, like Burdon-Sanderson, must of necessity contain statements which might give some colour for this implication, but the memoir brings forward as pertinent to the matter a letter written by Sanderson a year before his death. In this he expresses the view that a biological excitatory process (*i.e.* the condition of tissue activity) is something "organismal," by which he means "involved in organism." It is by no means clear what this connotes, but at least it is clear what in his opinion it does not connote, for he goes on to say that organismal changes, as such, are not measurable, that is, cannot be stated in terms of physics and chemistry. The writers of the memoir infer from this that Sanderson

"had come to the conclusion that physiological processes involve something which is neither physical nor chemical in nature, and which is not a mere mysterious accompaniment of these processes, but which is their essential part" (p. 169).

But in the letter already referred to Sanderson explicitly states that in science "nothing that is not measurable is known"; and it may be confidently asserted that he would never have allowed the scientifically unknowable to be incorporated in the sum of what constitutes physiological or pathological science. An organismal or vitalistic essence may find a place in other realms of knowledge, but not in one which claims to be a branch of science.

Burdon-Sanderson does not appear, therefore, to have departed fundamentally from the view which he expressed so often and so emphatically during his active scientific career and which is acknowledged in the memoir (p. 170). This view bases modern physiology on the introduction of physical and chemical methods of experiment and explanation. Some notes made by him as late as 1903 upon "The Pathway to Reality" (the Gifford lectures of his nephew, the present Viscount Haldane) show that he then still entertained the same opinion, since he wrote that "all discovery in biology is the discovery of the operation, where before concealed, of mechanical and chemical principles" (memoir, p. 168).

Whatever may be the issue as regards the adoption of more vitalistic conceptions in the future, it seems clear that a rational point of view, such as was the mainstay of biological progress in the latter half of the nineteenth century, was one which Burdon-Sanderson deliberately adopted; and it appears that he adhered to it throughout his life.

The memoir contains a curious oversight on the first page as to the year of Sanderson's birth, this being given as 1829 instead of 1828. It is embellished by at least one admirable and hitherto unknown likeness (p. 148), this being printed from a photograph taken by Miss Acland during Sanderson's later life in Oxford.

GEOLOGY OF THE PARIS BASIN.

Géologie du Bassin de Paris. By M. Paul Lemoine. Pp. vi+408. (Paris: A. Hermann et Fils, 1911.) Price 15 francs.

THE author of this work is already known to us as one of the compilers of the geological map of France, as also for his valuable researches on the geology of Madagascar and Morocco. The present volume treats of an area which geologically has, perhaps, been more completely studied than any other part of the world by such eminent authorities as Lamarck, Cuvier, Brongniart, Orbigny, Deshayes, Hébert, Barrois, de Lapparent, G. F. Dollfus, Cossmann, H. Douvillé, and a host of others. Some eight hundred titles of books and papers arranged alphabetically under authors' names form the bibliography, although, we are informed, this is by no means to be regarded as a complete list of the literature.

Preliminary remarks are made on the subjects of stratigraphy, petrography, palæontology, and tectonics. These are followed by a full account of the various deposits extending from Triassic to Quaternary times, due recognition being given to all zonal subdivisions of the rocks, with their index and characteristic fossils, a matter of so much importance especially in the true history of the Mesozoic formations. All such details are well arranged under the numerous localities represented in the Paris Basin.

In the order of description the stratigraphical deposits may be scheduled as follows:—

Jurassic	Trias	Eocene	Thanétien
	Rhétien		Sparnacien
	Hettangien		Yprésien
	Sinémurien		Lutétien
	Charmonthien		Bartonien
	Toarcien		Ludien
	Bajocien	Oligocene	Sannoisien
	Bathonien		Stampien
	Callovien		Chattien
	Oxfordien	Miocene	Aquitanien
	Rauracien-Séquanien		Burdigalien
	Kimeridgien		Helvétien
	Portlandien		Tortonien
Cretaceous	Neocomien		Sarmatien-Pontien
	Valanginien	Pliocene	Plaisancien
	Hauterivien		Astien
	Barrêmien		Sicilien
	Aptien		Quaternaire
	Albien		
	Cénomanien		
	Turonien		
	Sénonien		
	Emschérien		
	Aturien		
	Danien		
	Montien		

The geological nomenclature employed is mostly in accordance with that adopted in the late Prof. A. de Lapparent's last edition of the "Traité de Géologie," although among the Tertiary subdivisions we note the introduction of the new term "Chattien" for the inclusion of the *Calcaire d'Étampes* and the *Meulières de Montmorency*, beds which are regarded as forming the youngest of the Oligocene series and which were previously recognised by authors as belonging to the lowest Aquitanian rocks of the Miocene period. This is an adaptation of Fuchs' "Chattischen-Stufe," established for the Oligocene Sands of Cassel in North Germany, in which also was comprised the Ormoy beds of the Paris Basin. Subsequently M. G. F. Dollfus founded the name "Casselien" for the same horizon, but afterwards altered it to "Kasselien." On account of priority, therefore, we gladly support M. Lemoine in his recognition of "Chattien."

Students will appreciate the nine well-executed coloured geological maps that accompany this volume, as well as the numerous smaller maps and sections, showing considerable detail, which are inserted as text figures. The first of the coloured maps gives a general idea of the limits of the formations; a second is illustrative of the tectonic lines of the region; another depicts the areas where the lower Jurassic rocks are developed; a further map shows the marginal lines of the Sequanian, Portlandian, and Neocomian beds; in a fifth we have displayed the depth and altitudes of the Albian deposits; the next three explain the position of the Thanetian, Sparnacian, and Lutetian rocks, the remaining map exhibiting the regions of the Sannoisian and Aquitanian beds. We think that the introduction of some illustrations of characteristic fossils would have been an advantage, and we are likewise of opinion that one analytical index, to include localities, genera, as well as species, names of deposits, and every other item of importance, would have been preferable to the two indices given, which only affect specific names and localities. A properly prepared index is known to be an expensive matter in the publication of a reference work, but its existence is of supreme moment to the student and professor alike, who, without wading through an extensive "Table des Matières," frequently require to make rapid reference into the geology of a district, the distribution of a fossil, particulars of a rock structure, or to some problem of tectonic interest.

The book, however, contains a mine of information; it is excellently printed, the black-typed headings to the paragraphs giving a great clearness to the text, and we strongly commend it to all geologists interested in the structure of this region of France. R. B. N.

WIND CHARTS OF THE ATMOSPHERE.

Charts of the Atmosphere for Aeronauts and Aviators. By A. Lawrence Rotch and A. H. Palmer. Pp. 96+24 charts. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1911.) 8*s.* 6*d.* net.

THIS volume contains twenty-four charts, with accompanying text, dealing mainly with average wind conditions from ground level up to 30,000 feet, at the observatory at Blue Hill, Mass., of which Prof. Rotch is the founder and director, and at St. Louis. The book is intended for the use of airmen, and its aim is "to extend the work on surface winds and ocean currents done by Maury to the regions with which the navigator of an air-craft is concerned." The arrangement of the work, whereby all the charts appear on the right-hand page of an opening, and the corresponding descriptions on the page immediately opposite, is very convenient, and the clearness of the diagrams is enhanced by the absence of printing on their reverse sides, although this involves alternate blank openings like an atlas.

Chart 1 shows heights of clouds, and maximum heights attained by different species of air-craft. In Chart 2 is shown, *inter alia*, the average relation between wind velocity and height up to 30,000 feet at Blue Hill. The velocities in the lower layers were determined by means of kites; in the upper layers by means of theodolite observations of clouds, which took place "almost daily during two years." The curve exhibits an

almost constant rate of increase of velocity of about nine miles per hour per 5000 feet, except in the first few thousand feet, where the rate of increase is slightly higher. Chart 3 shows that the maximum velocity in winter is greater than that in summer, the difference increasing considerably with height. In charts 6 to 9 effective use is made of isopleths, or lines that show the variations of a quantity which is dependent upon two others. The simplest example of a diagram of isopleths is probably afforded by an ordinary contour map, showing the dependence of height upon position. In these charts, however, the three quantities represented are all of different dimensions; thus, charts 7 and 8 show how velocity varies with height and season, and with height and time of day, respectively.

In charts 10 to 19 are represented by means of wind-roses the percentage frequency and velocity of winds of all directions at heights ranging from 650 feet (ground level) to 10,000 feet at Blue Hill. The results for 650 feet are deduced from hourly observations made at the observatory; those for greater heights are obtained from 230 kite ascents made during fifteen years, on occasions when the velocity was more than ten and less than seventy miles per hour, this being the condition necessary for kite-flying. The results are similar to those obtained at Lindenberg, near Berlin, by Prof. Assmann, the main features being the ultimate decided preponderance of westerly and north-westerly winds in summer and winter respectively, and the gradual increase of velocity with height for all directions.

Chart 21 correlates the preceding ten charts by indicating how to pass from those drawn for one level to those for the next higher level; it shows how to forecast the average upper winds from a knowledge of the surface wind and the prevailing atmospheric circulation, taken to be either cyclonic or anticyclonic. To the aeronaut and aviator this problem must ever be of great importance.

The next charts give wind-roses for the region of the north-east trade wind, and indicate clearly the existence of the south-west anti-trade. These results are derived from 715 observations of direction and velocity in sixty-seven balloon ascents made during four expeditions by M. Teisserenc de Bort and Prof. Rotch on board the *Otaria*.

The volume concludes with a chart giving two summer airship tracks across the Atlantic; one from Boston to London in the region of prevailing westerly winds, the other from Lisbon to the West Indies through the trade wind area. This chart will be of much interest to aeronauts who wish to emulate the example of Messrs. Wellman and Vaniman.

The facts set out should become familiar to the meteorologist as well as to the airman. To the latter, the charts represent, so to speak, the wind-climate of the region in which his craft move, and they are consequently of importance to him. They will not assist him to forecast the likelihood of dangerous phenomena like line-squalls—for that information he must look elsewhere—but as these exceptional occurrences are comparatively infrequent, the average state of the atmosphere as represented on the charts is also usually a reasonable guide to the conditions to be expected on a particular occasion.

Prof. Rotch was a pioneer in the development of modern methods of upper-air research, and this work will be welcomed by all who are interested in the practical and theoretical problems of the atmosphere. R. C.

FIRST AID ON THE FARM.

Veterinary Studies for Agricultural Students. By Prof. M. H. Reynolds. Pp. xix+290. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1910.) 7*s.* 6*d.* net.

IT is no easy task to write a useful work on elementary veterinary science for laymen, for we venture to say that in no other science does the old proverb apply so obviously, viz., "A little knowledge is dangerous." We must candidly admit, however, that the task has been admirably accomplished by the author of the work under review. That the work should have run into seven editions in seven years speaks for itself.

Roughly speaking, the book is divided into six sections, viz.: Anatomy and Physiology, Pathology, Causes and Prevention of Disease, Infectious Diseases, Non-infectious Diseases, and Obstetrics. The bearing of the earlier sections on the later ones is obvious, for one must of necessity be able to recognise the normal conditions before being able to detect departures from the normal. The author rightly sounds a note of warning against "the blind home-dosing of stock to which farmers and stockmen are very much inclined," and frequently in the course of the book he warns the owners for their own sakes not to attempt treatment of any other than the simpler ailments. On the other hand, where skilled veterinary assistance is not available, the information given in this book may be of very great service. The chapters on disinfection and ventilation are especially good.

It would be a very remarkable book indeed in which no faults could be found, and the criticisms we offer are in the hope that they may be borne in mind when another edition is called for. On

page 12 the sesamoid bones are described as being "triangular." Their shape is more correctly "pyramidal." In connection with the description of the stomach of the ruminant, it would be an advantage if it were dealt with a little more fully. At present the description is far too meagre to be of any service. On p. 92 a list of hereditary diseases is given as scheduled by the Minnesota Stallion Law. Navicular disease is not included, although there is ample evidence of its hereditary nature. Laminitis is probably debatable as a hereditary disease, but it might be included in such a list of undesirable points with advantage, for the conformation so commonly associated with it is undoubtedly hereditary. The make-up of chapter xx. seems to us to have got rather mixed, for the two first paragraphs of p. 92 referring to heredity would be more appropriately placed to follow the paragraph on in-and-in breeding on p. 90, instead of being sandwiched between paragraphs referring to air.

The chapter on Actinomycosis is very good indeed, although we should be very sorry to see anybody, farmer or veterinary surgeon, resort to the caustic line of treatment as outlined on p. 149, especially as better results can be obtained by internal medication without producing the same amount of pain and suffering.

The illustrations throughout the book are excellent on the whole, though we fail to see any point in the inclusion of Figs. 74 and 75. In neither case is there anything shown at all diagnostic of milk fever.

We have no hesitation in recommending this book to agricultural students, for it should be of great service to them in the pursuit of their veterinary studies.

THE NATURE OF BONE.

Der Aufbau der Skeletteile in den freien Gliedmassen der Wirbeltiere. Untersuchungen in urodelen Amphibien. Von Prof. H. von Eggeling. Pp. vi+324+4 plates. (Jena: Gustav Fischer, 1911.) Mk. 16.

AT the present time the problems relating to the precise nature and mode of development of osseous tissue are being submitted to a searching scrutiny, and many of the most cherished beliefs of the majority of anatomists concerning the process of evolution and the real structure of bone are being threatened. Great activity is being displayed in investigating such problems as the mode of deposition of the calcium salts in the scleroblastema; the precise relationship of this process of calcification to the cells which in a sense determine it; whether there is any fundamental distinction between enchondral and intramembranous ossification; and whether bone is really the inert, unchanging tissue one is apt to think essential in a skeletal support.

These problems and others of a similar nature are forcing themselves upon the attention of workers in widely separated fields of biological inquiry. Surgeons like Sir William Macewen, as the result of clinical experience, have been led to question the current accounts of the development of bone; radiographers have been amazed to find how rapidly an acutely-inflamed bone reacts to the inflammatory process and becomes transparent to the X-rays; palæontologists have been puzzled to explain why obviously homologous bones in two amniotes may ossify in different ways, being enchondrous in one and intramembranous in another; anatomists find a difficulty in drawing a sharp line of distinction between enchondrous and intramembranous bone in certain parts of the skeleton; and embryologists and bio-chemists meet with many difficulties when they attempt to explain the precise mode of deposition of the calcium salts and the nature of the tissues in which they are laid down in the process of bone-formation.

Most of the work which hitherto has been done with the object of elucidating these and allied problems has been based mainly upon the investigation of the more highly organised and specialised Amniota. But Prof. von Eggeling has wisely selected for his research the simplest and least modified material he could obtain: he has devoted his whole attention to the investigation of certain specific features of the process of ossification in the limb-bones of the Urodele Amphibia, the most primitive vertebrates possessing limb-bones precisely comparable to those of the Amniota.

His results are presented in the form of this large monograph, packed with a mass of detailed information relating to the ossification of the limb-bones in twenty-four species, representing every family of the Urodela.

He gives a long and minute analysis of the voluminous literature relating to the structure and histogenesis of so-called coarse-fibred and fine-fibred bone; and then sets forth his own observations.

The most primitive osseous tissue is a product of the periosteum, but the dental cement and part of the placoid-organs of Selachians are of the same nature. It assumes its distinctive form by reason of the fact that the scleroblasts develop first amidst a coarse-fibred matrix of connective tissue.

At a later stage, both in phylogeny and ontogeny, buds of vascularised tissue eat their way through the sheath of coarse-fibred bone into the cartilaginous core; and in this loose delicate

tissue fine-fibred bone becomes laid down in concentric layers, lining the canals which lodge the vascular material. This "marrow-bone" (*Mark-knochen*) represents the superstructure laid down upon the more ancient coarse-fibred bony foundation, perfecting its structure, and rendering it more efficient as a weight-bearer. The medullary cavity is formed by the anastomosis of the intrusive canals filled with highly vascular tissue, which forms the rudiment of the marrow.

A great deal of precise and suggestive information is given in regard to these and other matters, such as the phylogeny of the Haversian canals and the nature of epiphyseal centres of ossification.

The chief interest of the book lies in the support it gives to the growing conviction of the essential uniformity of the processes of ossification, although perhaps its author might not go so far as to admit this. G. ELLIOT SMITH.

OUR BOOKSHELF.

The Story of the Five Elements. By E. W. Edmunds and J. B. Hoblyn. (The Library of Modern Knowledge.) Pp. viii+264. (London: Cassell and Co., Ltd., 1911.) Price 2*s.* 6*d.* net.

THIS book is of a type now becoming more common, an elementary account of science intended for "the intelligent general reader who, having a genuine interest in science, is nevertheless unable to follow up any one branch of it in close detail." To write such a book successfully a sound knowledge of the subject, a gift of attractive exposition, and a good literary style are necessary. These are evinced in a very satisfactory measure by the authors of the work before us. No serious misstatement has been noticed during perusal—nothing more important than the use of "dephlogisticated" for "phlogisticated" on pp. 70 and 89. The exposition is clear, and a fresh turn is given to the story of elementary chemistry by following the track of the ancient "elements." The language is not hackneyed, nor yet aggressively unconventional. A perusal of the book will not make a chemist, but it will give a just idea of chemistry to an intelligent reader; and to an elementary student, in the shackles of a traditional text-book, it will afford a salutary relief, a breath of fresher air. A. S.

An Introduction to Therapeutic Inoculation. By Dr. D. W. Carmalt Jones. Pp. xiv+171. (London: Macmillan and Co., Ltd., 1911.) Price 3*s.* 6*d.* net.

THIS book, by one who is a pupil of Sir Almroth Wright and the director of the department of bacterio-therapeutics of a London hospital, may be taken as an authoritative guide to the inoculation method for the treatment of infective diseases. It is divided into two parts, the first dealing with the principles underlying the method, the second with its practical application. Stress is rightly laid on the importance of the exact diagnosis of the nature of an infection by bacteriological methods, and it can scarcely be doubted that in the future exact diagnosis of the condition and the treatment of the infection itself will become more and more laboratory procedures, the function of the clinician being to decide if the disease is an infective one, to aid the recognition of the disease by the use of physical methods of diagnosis, to invoke laboratory methods to assist in the diagnosis, to exercise a general control over the patient, and to treat the general condition of the patient and any complications that may arise.

Full directions are given for the estimation of the opsonic index, which, in spite of adverse criticism, is considered by the author to possess considerable value for diagnosis and treatment, and for the preparation of the vaccines necessary for the inoculation treatment. Finally, the practice of inoculation in the treatment of various infections is fully considered.

R. T. H.

The Babylonian Expedition of the University of Pennsylvania. Series A: Cuneiform Texts. Edited by H. V. Hilprecht. Volume xxix., Part i.: Sumerian Hymns and Prayers to God (*sic!*) Nin-ib from the Temple Library of Nippur. By H. Radau. Pp. x+88+21 plates. (Philadelphia: Department of Archæology, University of Pennsylvania, 1911.)

ONE of the most interesting peoples of the ancient world was the Sumerian race, which founded the great civilisation of Babylonia. The cuneiform writing of western Asia was their invention, and the religious system of Babylon, which had so great an influence upon the Hebrew cult from which Christianity sprang, was originally theirs. Among the spoils of the American expedition to Nippur, in southern Babylonia, which are now being published under the editorship of Prof. Hilprecht, were a large number of the usual clay tablets inscribed with Sumerian hymns to the god Ninib. These are now translated and described by Herr Hugo Radau. That he has done his work well there can be no question, though we may not agree with all the conclusions he draws from his material. The non-Semitic Sumerian language, entirely different from the tongue of the Semitic Babylonians who borrowed the culture, including the script and religion, of the Sumerians, offers peculiar difficulties to the translator, and others may not always agree with the interpretation which Herr Radau gives to individual words and phrases of his texts; but the general sense of the originals is clear enough. Of the religious tone of these hymns, the best idea is to be derived from a perusal of them. We scarcely agree with the exaggerated estimates which their translator, perhaps pardonably, is often led into with regard to them, and his "macrocosmology" and "microcosmology" seem far-fetched. But of the main facts as expounded by him there is no doubt.

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.]*

Acquired Characters and Stimuli.

DR. ARCHDALL REID is usually so luminous in his statements concerning heredity that I hesitate to express my disagreement with what he has written in NATURE of February 29, and elsewhere previously, as to the use of the term "acquired characters." It is, of course, true with regard to this term, as with regard to a great many others, that it can be interpreted to mean what its original user, namely, Lamarck, did *not* mean. But I cannot see that anything is gained by so doing. On the contrary, in such cases it seems to me best to endeavour to keep the term for what its introducer meant by it. I also fail to see any advantage in grouping together the various necessary chemical and physical environments of a living thing under the word "stimuli." They do not become changed in nature by the application to them of that term, which is customarily used with more limited application.

It is, of course, true (and I should suppose thoroughly familiar to every biologist) that the reproductive germ of an organism unfolds or "develops" in response to the action upon it of certain surrounding conditions—its environment. When those conditions are "normal," a normal germ develops in response to them—the normal characters of the species. When the conditions to which the young organism is exposed are in some limited degree and in regard to certain ascertainable factors abnormal, the organism develops (in some cases) one or more abnormal characters differing from those developed by an otherwise equivalent specimen retained in the normal environment. The new character or characters developed in response to the abnormal environment (which we assume to be allowed to act on the growing young organism only, and *not* on its parents) are called by Lamarck—and by those who wish to discuss Lamarck's theory—"acquired characters" (*changements acquis*). The word "acquire" is used to mean "something added to" or "changed in" the normal form of the species.

It is not, I think, permissible to say that the normal characters which arise in response to normal conditions are with equal fitness to be described as "acquired." Of course, *all* the characters successively developed by a growing reproductive germ or young organism *may* be spoken of as "acquired" by the organism during its growth from extreme youth to age. But to do so when discussing Lamarck's theory is deliberately to create confusion. The thing in addition to and upon which "acquirements" are made is, in Lamarck's use of the word "acquire," not the growing individual, but the normal specific form as exhibited in normal individuals. That, I take it, is Lamarck's meaning, and it is that which I and others have for more than twenty-five years accepted. I am sorry to say that to use the word "acquired" at this period of a historical discussion, in another sense, is what an unfriendly critic (which I am not) would call "quibbling," and, moreover, quibbling without any discernible object or purpose.

I should like once more to point out (as I did many years ago in a similar correspondence in these pages) that the measurable factors of the normal environment of a species of plant or animal often exhibit within that normal limit a great range in quantity and intensity. This range differs in different species and groups of organisms, but, as a rule, the normal specific form is developed under conditions which are not very closely limited. A species is usually so "wound up" (to use a metaphor) as to be stable under a wide range of conditions. Outside that range we find first a zone or area of excess or decrease of one or more factors of environment, such as heat, light, moisture, mechanical pressure, chemical character of food, &c., within which the organism still flourishes whilst giving *new* or *abnormal* responses to the *new* and *abnormal* quantities of the environmental factors. These responses are Lamarck's *changements acquis*—our "acquired characters"—characters which are not those of the species when existing in the by no means narrowly limited range of factors which are its normal environment.

Beyond this zone or area of *potential* (or tolerable) environment with its corresponding *potential* development of acquired characters not normal to the species in normal environment, we come to a further zone of larger increase or decrease of environmental factors. Here the organism does not respond as a living thing; it has no reserved potentialities which are called into activity by this further increase or decrease of one or more of the factors of the environment; the environment has become impossible or destructive, and the organism ceases to live.

It is important to distinguish these three zones of limitation in increase or decrease of factors of the environment for every species, the normal, the potential, and the destructive. It is a necessary part of bionomic inquiry to determine the range *plus* and *minus* of the several factors of each quality of environment—normal, potential, and destructive—in regard to whole series of species of both plants and animals.

E. RAY LANKESTER.

Bournemouth, March 9.

Coordinated Purchase of Periodicals in two Newcastle Libraries.

IN 1905 Dr. Thomas Muir read a paper before the Royal Society of Edinburgh entitled "Library Aids to Mathematical Research," in which he urged that unnecessary duplication in the purchase of periodicals should be avoided by adjacent libraries. The matter has been taken up in NATURE, *e.g.* in vol. lxxxvii., p. 222. The following brief account of what is being done in this regard in Newcastle-upon-Tyne may therefore be of interest.

In 1908 representatives of several Newcastle institutions met in the Public Library, at the invitation of the public librarian (Mr. Basil Anderton), to consider whether any coordination could be effected as regards the purchase of certain learned societies' journals and some of the more expensive and less used periodicals. Armstrong College was represented by Profs. Bedson and Jessop. Prof. Duff, who had for a considerable time manifested cordial sympathy with the project, was unavoidably absent from the meeting. In the course of discussion various journals were named in regard to which concerted action seemed desirable, but for one reason or another, while the principle was commended, only the representatives of the Public Library and Armstrong College were at the time ready to take practical steps in the matter.

Prof. Jessop moved that a beginning be made with certain mathematical journals, and that of those that were being bought in duplicate (one by each institution) some be discontinued, and that the money so set free be applied to the covering of fresh ground. The suggestion, as modified by discussion and finally moved by Prof. Jessop, was approved, and the public

librarian embodied it in a recommendation which he laid before the Public Libraries Committee, which resolved that the Public Library should stop taking in the following:—London Mathematical Society Proceedings; *Journal de Mathématiques*; *Quarterly Journal of Mathematics*; *Fortschritte der Mathematik*; *Mathematische Annalen*; and should take instead: *Annali di Matematica: Tortolini*; *Bulletin de la Société Mathématique de France*; *Atti dei Lincei*; *Zeitschrift für Mathematik: Schlömilch*; *Giornale di Matematiche: Battaglini.*

The Public Library periodicals were to be stored so as to be accessible to Armstrong College readers, duly accredited, for consultation in the library and for use at home. For future volumes of the first set of periodicals, properly accredited Public Library readers were to have similar access to Armstrong College volumes.

A copy of the resolution was sent to the Library Committee of Armstrong College, which likewise adopted it. The curators of Armstrong College Library (Profs. Bedson and Duff) and the public librarian were then in a position to carry the scheme into practical working. They decided the appropriate dates for discontinuing old periodicals and for starting new ones; they arranged that the students of each library should be admitted to corresponding privileges in the other library; and they drafted and printed the necessary regulations and forms.

As the scheme was found to work satisfactorily for the mathematical section, the committees concerned authorised extension of the idea. The officers accordingly made further revisions in other subjects, at meetings which they held from time to time. The classical section was first dealt with, and the responsibility of providing the leading periodicals was allocated to one institution or the other. Other sections were dealt with in due course. In this way all the more important journals taken by the two institutions (scientific, historical, philosophical) have been assigned to one or other of the libraries, with the result that unnecessary duplication of expenditure is now avoided. Naturally, a certain amount of duplication is still necessary, since a single copy will not always answer the needs of students. But the general result is that a good deal of money has been set free, and has been used for covering fresh ground.

The same principle has also, to some extent, been adopted as regards buying expensive books, of which one copy in the town is sufficient. It may be added that, as a side issue of this cooperation, there will shortly appear, in a catalogue which the Public Library is issuing, the titles of a number of interesting books on classical subjects which the library of Armstrong College possesses, but which are not duplicated in the Public Library.

BASIL ANDERTON.

Public Library, Newcastle-upon-Tyne.

Mars and a Lunar Atmosphere.

IN his interesting letter on the above subject in NATURE of March 7, Mr. Whitmell is quite correct where he mentions that the moon was at full on October 16, 1902, when, according to my note, Prof. Luther observed an occultation of Mars. In fact, there was a total eclipse that night, and that was the phenomenon which Prof. Luther actually observed.

The abridgment of a previously condensed translation led to the substitution of the misleading "similar," and I must apologise to Mr. Whitmell for the trouble this may have caused him in looking the matter up. Prof. Luther on that occasion observed a section of a dark concentric ring bordering the small crescent of the nearly totally eclipsed moon, and this he suggested might be caused by the absorption of a fairly extensive atmosphere.

THE WRITER OF THE NOTE.

Observed Fall of an Aërolite near St. Albans.

UNDER the above heading in the issue of NATURE for last week I reported upon the circumstances and other details of a supposed fall of a meteorite during the storm of March 4, as described to me by an observer, Mr. H. L. G. Andrews, at Colney Heath, near St. Albans. I have now submitted the stone for examination to Dr. George T. Prior, of the British Museum (Natural History), who informs me that it is not of meteoric origin. G. E. BULLEN.

Hertfordshire Museum, St. Albans, March 16.

THE INFLUENCE OF WEATHER ON BEES.

ALTHOUGH all who are interested in bees, either from the scientific or the commercial and practical sides, are agreed that the weather plays a most important part in their lives, very little appears to have been done to ascertain the exact effects which different kinds of weather have upon them. The reason may well be that those who are interested in bees from a practical point of view would not be able to devote the time necessary to the making of elaborate observations of the weather and the weighing of colonies daily, to say nothing of the laborious calculation necessary to ascertain the results of the observations.

In the autumn of 1910, the so-called Isle of Wight disease was raging very fiercely in the southern counties, and to account for the widespread character of the scourge, many beekeepers advanced the idea that a succession of bad seasons was responsible to a great extent, if not entirely, for the trouble.

It seemed to me that the proper course to pursue was to make a long series of observations in order to find out what particular kinds of weather were most conducive to the well-being of bees or the reverse. I therefore commenced, in April of 1911, a series of experiments. Commencing with a strong colony, which weighed with its hive 39 lb. on April 20, I began to weigh it every evening, and on May 5, for the sake of comparison, I also weighed a weak colony. This only weighed with its hive 36½ lb., the other being on that date 8 lb. heavier. The bees were hybrids, an excellent and good-tempered variety, eminently suitable for experiments, though not the best of honey gatherers.

The queens of both colonies were sisters, that of the strong one having been raised in 1909, and that of the weak one in 1910. It is pretty universally agreed among beekeepers that a queen in her second year is at her best, and according to this idea, which is quite sound, the weaker colony should have done better than the other, but there is a factor in the situation which is really more important than the age of the queen. This is the amount of stores possessed by the colony at the commencement of the season. Should there be a shortage of stores, breeding is much slower;

and although, by artificially feeding the weaker colony for the first week or so, I might have made good the deficiency, I wished the experiments to represent as far as possible the natural increase of the bees. To this may be attributed the comparatively poor results achieved in a good season.

My apiary is situated about 300 ft. above sea-level, and stands in a sheltered, sunny position. The main honey-producing plants are, in April, the sallows and the bush fruits, currants and gooseberries. Then follow, in this case during the first ten days in May, pears, plums, cherries. After this the apples (both cultivated and wild) produced a plentiful supply of nectar, and these, accompanied by the holly, sycamore, and horse chestnut, lasted till nearly the end of the month. The maple, which in some districts is a valuable aid to brood rearing, is scarce near me.

Down to May 20 the weather had been of a somewhat varied character, the sky being frequently overcast and seldom clear, the winds mainly from the south-west, and light to fresh in force. The temperature, however, was above the mean, the minima being exceptionally high for the period. On the evening of the 21st the strong colony was 17 lb. heavier, and the weak one only 4 lb.

On the 22nd the temperature rose considerably and the sky was clearer; in the ten days ending May 31 the strong colony gained 16 lb., and the weak one 4 lb. The hawthorn came into bloom soon after the middle of the month, and provided a very heavy crop of pure honey of delicious flavour and density. This hawthorn honey-flow continued during the first ten days of June, and during that period there was a gain of 8 lb. in the strong hive and 3 lb. in the weak one.

By this time the strawberries were in bloom, and the main honey flow seemed to be close at hand. The blackberries, which are a great honey source in this neighbourhood, began about the 5th of the month, and the white clover, from which the main crop is usually gathered, on the 8th. Notwithstanding this, the remainder of the month was of an exceedingly disappointing character, owing to the prevalence of high winds, low temperatures, and largely overcast skies. On June 30 the colonies weighed 82 lb. and 47 lb. respectively, being a gain during the twenty days of 2 lb. and ½ lb. only.

No sooner did July open, however, than the weather improved, the wind blowing lightly from the north-east, the sky clear, and high temperatures prevailing. Honey came in at a great rate down to the 22nd of the month, when the flowers dried up completely on account of the drought. During this period nearly all the surplus was procured from the white clover; the limes, which were certainly blooming freely, seeming to have little attraction for the bees, and the blackberries producing only a small portion of the surplus.

In the twenty-two days the strong colony gained 32 lb. and the weak one 25 lb.

Before passing on to state the conclusions I arrived at after tabulating all the results, I may point out how marked is the difference between the colony having large stores to commence the season with and one that is deficient in that respect. As will be seen, the weak colony did practically nothing during the May honey flow, owing to its being so much behind in breeding; but when the queen, having plenty of supplies, began to push the breeding, the colony pulled up nearly level, and had there been any heather here it is most probable she would have outstripped her older sister. This is a lesson the practical beekeeper may well take to heart. A few pence spent on sugar in the autumn will be amply repaid by an early crop of honey the following season.

The next striking thing is the suddenness with which a flow of honey commences and leaves off. In the May flow, for instance, after three days when there was an actual loss of weight, and one where there was only a gain of ½ lb., the next day showed a gain of 3 lb., which continued more or less for several days. Again, on July 2, the gain was ¼ lb., but on the 3rd 2¼ lb., followed by 3¼ lb., 4½ lb., 2½ lb., 3½ lb., 3½ lb., 2 lb., 2 lb. This offers another useful lesson to the beekeeper. A day's delay in putting on surplus chambers may result in the bees swarming; for once they commence preparations, which they do as soon as they find their quarters getting cramped, no device will stop them, and they will refuse to enter the supers. If the extra room is provided in good time, they take to it readily and work steadily on.

It is impossible in the space of this short article to give the details of the observations made. All that can be done is to state as briefly as possible what conclusions are to be drawn from an analysis of them.

The total gain of the strong colony, which I will call No. 1, was 76 lb., which is an average of 0·791 lb. per day. The weak stock (No. 2) gained 36¼ lb., or an average of 0·447 lb. per day.

The range of pressure over the whole period was very small, the barometer being universally high, but I have divided the readings into three equal parts, high, medium, and low. On the twenty-eight days when the mercury was high the gains averaged for No. 1, 1·402 lb.; No. 2, 0·936 lb. On the thirty-one medium days, No. 1 averaged 0·710 lb., and No. 2 0·218 lb. On the days of comparatively low pressure, No. 1 averaged 0·203 lb., and No. 2 0·125 lb.

Here we have conclusive evidence that a high barometer is favourable. Especially is this the case with the weak stock, for it does very badly under any except the best conditions.

With regard to temperature, I have divided the maxima also into three sections, those under 65° F., those between 66° and 75°, and those above 75°. As may be expected, with the high readings come good results, the average being 1·182 lb. for No. 1, and 0·743 lb. for No. 2. With a medium day temperature, No. 1 averaged 0·723 lb., and No. 2 0·213 lb. Under low temperature I find the results extremely poor, the average of twenty-three days being 0·108 lb. for No. 1, and an actual loss of 0·068 lb. for No. 2.

No doubt the extremely bad effect of low day temperature on a weak colony is occasioned by the necessity on such days for the bulk of the population to stay at home and keep up the temperature, or, alternatively, the loss of brood by chilling.

Of course, the influence of the weather is felt in two distinct ways. There is the effect on the bees themselves, regulating the numbers that are able to leave the hive, and also the influence on the flowers, occasioning a variation in the amount of nectar secreted.

It is generally held that warm, moist nights are favourable to the secretion of nectar, but although my results show that more honey was secured when the previous night's temperature was high, yet when we remember that the extremely low temperatures occurred when there were few flowers in bloom, the evidence is not sufficient to enable us definitely to state that warm nights induce a flow of nectar.

There is much less disparity in the results under this head than with any other elements, the results being for temperatures under 50°, 0·542 lb. and 0·147 lb.; for those from 50° to 57°, 0·716 lb. and 0·343 lb.; and for those above 57°, 1·150 lb. and 0·775 lb.

Some time ago an undoubted authority on bee-keeping gave it as his opinion that there was very rarely a flow of honey during the prevalence of an east wind. In order to gain some evidence on this head, I divided the tables of the direction of the wind into two parts, the first showing easterly winds, including all winds blowing from the north to south-south-east, the other including all winds blowing from the south to north-north-west. The result shows a decided advantage in favour of the easterly winds, the returns being 50 per cent. more in the case of the strong stock, and 25 per cent. in that of the weak one. It is not difficult to find the reason for this, for when the wind is in the west or south-west, other conditions are unfavourable, they being generally accompanied by cloudy skies and showery weather. On the other hand, the highest average of gains occurs when the wind is due north-east, such winds bringing dry, cloudless weather in most cases.

Of more importance is the strength of the wind. The average results when the wind was light or moderate in force were in both cases more than four times better than when the wind was blowing freshly.

In this case the strong stock suffered more than the weak one, the only instance where the weak stock proved superior. From this I conclude that the strong stock, being able to send out a larger proportion of foragers, suffered proportionately heavier losses of bees. The slightest difference in the time taken by an individual bee to return to its hive must have a great effect when we consider the thousands of journeys made in a day. Moreover, the more slowly the insects fly, the more liable are they to fall a prey to predatory birds. Many are no doubt blown to the ground by gusts of wind and become chilled before they have recovered strength to rise again. It is also certain that some, foraging on the extreme edge of the usual mile radius, are blown out of their course into regions unknown to them, and are unable to find their way back again. I am of opinion that on days when the wind blows strongly the hive entrances should be shaded, so as to tempt the bees out as little as possible, unless the hives are so situated that the bees have their foraging ground immediately around them, such as on a moor or in a clover field. If they have to fly high or travel far for their supplies, the gain of honey, if any, will be more than counterbalanced by a great loss of bees.

By far the most important element in the weather is the degree of sunshine. Warmth, dryness, stillness are all favourable to the increase of the colonies, but without bright sunshine the best results cannot be secured.

During the whole period there were fourteen days on which the sky was completely overcast, and the average for those days showed a net loss of 0·053 lb. in the strong colony, and 0·146 lb. in the weak one; whereas the average gain when at least a part of the day was quite clear was more than 1¼ lb. in No. 1, and a trifle under 1 lb. in No. 2. There were twenty-four days when the sky was intermittently overcast, and in both cases the average is below the mean of the whole period. The reason for this is that bees in the open fields when the sun is shining hurry home as soon as a cloud comes up. Sometimes, in the height of the honey flow, a cloud passing over the sun will bring them home at such a rate that on one or two such occasions I have gone out, thinking they were swarming.

I am a great advocate of placing hives where they will get the maximum sunshine, and I never allow any permanent shade near them, believing that every gleam of sunshine is gain to the hives. If it happens that the weather is cold in the early spring, or a strong wind blowing, it is easy to prop a board over the entrance to keep them in, but it is not so easy to take away a permanent sun-excluder on favourable days.

The tables showing the gains under varying degrees of humidity do not reveal any preponderance in favour of either a high or low rate of moisture. As I mentioned before, some believe that warm, moist nights are favourable to the secretion of nectar, and I hope in the course of the experiments I make in the coming season to be able to gain some definite knowledge regarding this.

The rainfall over the whole period was so small that it gives but little information, but in every case where rain fell during the previous night or on the day in question, there was either a loss or at best a very small gain.

To sum up, the facts which I consider established are:—

First, that sunshine is of the utmost importance, and every beekeeper should see that his hives get the maximum of it. This is obtained

by placing the hives quite in the open, with the entrances facing south-east. They thus secure the earliest rays of light, and the bees are tempted to start work early.

Secondly, high winds cause great loss among the colonies, and it would be advisable when such prevail to keep the bees confined to the hives, unless there are sources for honey-gathering in the immediate vicinity. Unless the supers are on, the bees should on such occasions be fed artificially, so that the work of brood-rearing may not be hindered.

Thirdly, during a honey flow in the early part of the season weak colonies must have all the heat possible conserved by contraction of the brood-chamber and heavy top coverings, so that the largest number of foragers may be released.

Fourthly, as soon as the brood combs are well covered with bees, and the weather fine, the supers should be put on and covered up warmly. A day's delay at the crucial moment may ruin the prospects of a colony for the season, causing swarming and waste of time during the honey flow.

And, finally, the difference between the results secured by these two colonies shows that it is of very great importance that stocks go into winter quarters with abundance of stores, so that the earliest spell of fine weather may be utilised by the queen for pushing the breeding. The honey flow from the fruit and forest trees may be made a considerable source of revenue if colonies are got into strong condition in time to take full advantage of it.

HERBERT MACE.

THE VIVISECTION REPORT.

THE Royal Commission on Vivisection published, on February 12, its long-delayed report. Four years have elapsed since the Commissioners ceased to hear evidence: and we are left to guess at the causes of this delay. The report is already out of date: it says not a word about the work of Flexner, the work of Ehrlich, the work of Bruce, since 1908; it says nothing of the latest results of the preventive treatment against rabies and typhoid fever, nor of the latest diphtheria statistics from the hospitals of the Metropolitan Asylums Board.

Still, we can afford to forgive these defects: for the report, happily, is unanimous. There is no minority report. Two of the Commissioners died in the course of the inquiry; the remaining eight all sign the report. Three of them sign it subject to certain reservations, contained in memoranda; but these reservations leave untouched the main outlines of the report. The changes recommended by the Commission are of no profound importance to science, and are all of them within the province of the Home Office. There is none of them that requires the intervention of Parliament; and it is certain that Parliament has graver matters to think of than the exact estimate of experimental physiology and pathology.

The report is rather colourless: that is the price of unanimity. It deals with certain anti-vivisection statements politely, but there is a politeness which is not to be mistaken for approval. It reviews, quietly, what we all know already—the mighty deeds of the last thirty years, the development of Pasteur's principles, the work of Lister, the magnificent warfare against tropical diseases, and so forth. It devotes attention to the benefits gained by animals from experiments on animals; and to the public recognition of the value of such experiments. It recommends a slight increase of the Inspectorate, a further restriction of experiments under Certificate B, a special restriction of experiments involving the use of curare, that drug so much talked of and so seldom seen, and so forth. It contains some good passages: for instance:—

"We desire to state that the harrowing descriptions and illustrations of operations inflicted on animals, which are fully circulated by post, advertisement, or otherwise, are in many cases calculated to mislead the public, so far as they suggest that the animals in question were not under an anæsthetic. To represent that animals subjected to experiments in this country are wantonly tortured would, in our opinion, be absolutely false."

And again, of certain anti-vivisection witnesses:—

"After careful consideration of the above cases, we have come to the conclusion that the witnesses have either misapprehended or inaccurately described the facts of the experiments."

Thus, in spite of its colourless, dull style, the report is fairly satisfactory to men of science, and to the public. It comes at a time when the public is concerned with heavy national trouble and peril; and we believe that the public will be glad to leave the whole subject to the experts and to the Home Office.

NOTES.

IT is officially announced that the King has appointed Sir J. J. Thomson to the Order of Merit. Other men of science who are members of the Order are Lord Rayleigh, Dr. Alfred Russel Wallace, and Sir William Crookes.

WE understand that a portrait bust of the late Sir Joseph Hooker, from a sitting taken just before his death, has now been completed by Mr. Pennachine, the sculptor. A few visitors at Mr. Pennachine's studio, 68 Western Road, Ealing, W., consider it an excellent piece of work.

DR. CHARCOT has been awarded the gold medal of the Paris Geographical Society, in recognition of his work of exploration in south polar regions.

AT the anniversary meeting of the Royal Irish Academy on March 16, Prof. Jean Gaston Darboux and Prof. Elias Metchnikoff were elected honorary members of the academy in the section of science.

IT is announced that the twentieth "James Forrest" lecture will be delivered at the Institution of Civil Engineers on Friday, April 19, by Mr. H. R.

Arnulph Mallock, F.R.S., his subject being "Aërial Flight."

DR. ALES HRDLICKA, curator of physical anthropology, United States National Museum, has been appointed as the representative of the Smithsonian Institution at the eighteenth International Congress of Americanists, which will meet in London on May 27 to June 1. He has also been designated by the State Department as a representative of the United States on this occasion.

THE eleventh general meeting of the Association of Economic Biologists will be held at Dublin on March 28–29, under the presidency of Prof. G. H. Carpenter. Among the subjects of papers to be read and discussed are:—biological training for agricultural students; parthenogenesis; methods of testing grass seeds; the culture of *Phytophthora infestans* (the potato-blight fungus); the food of birds; the pollination of hardy plants; and cereal breeding.

WE are informed that the collection obtained by Mr. Edmund Heller, who represented the Smithsonian Institution on Mr. Paul J. Rainey's African expedition, will rival that made by the Smithsonian African expedition in 1909 and 1910. In all there are about 700 large mammal skins in salt, 4000 small mammal skins, and a large number of birds and reptiles, most of them coming from regions not visited by the previous expedition, while some are from remote localities never before visited by naturalists.

FROM a report in *The Times* we learn that at a meeting of the Council of the Royal College of Surgeons on March 14, Sir Henry Morris, in the course of an eloquent tribute to Lord Lister, said:—"His gentle nature, his deep compassion, his courteous and dignified bearing, his imperturbable temper, his resolute will, his indifference to ridicule, his tolerance of hostile criticism combined to make him one of the noblest of men. His work will last for all time; its good results will continue throughout all ages; humanity will bless him for evermore; his fame will be immortal." The council unanimously decided that this tribute should be inscribed upon a tablet and placed in a suitable position within the walls of the college, "to serve as evidence to future generations of the honour, respect, and reverence in which the great founder of aseptic surgery was held by his contemporaries and immediate successors."

THE experiments about to be undertaken by the Board of Agriculture and Fisheries in the breeding of horses on Mendelian lines will be watched with great interest. Impressed with the results of breeding on such lines in the case of the smaller domesticated animals, Captain Dealtry C. Part has given to the Board a large sum of money for carrying on similar experiments with horses. The direction of these experiments has been entrusted to Major C. C. Hurst, director of the Burbage Experiment Station, who will have the advice and assistance of Mr. F. W. Carter, superintending inspector of the Board of Agriculture. It has been decided that the best type of light horse for general purposes is the weight-carrying hunter, while the best foundation stock for crossing is the thoroughbred, and it is proposed to try to produce from the latter a distinct breed possessing the qualities of the former. The foundations for such a type already exist in weight-carrying steeplechasers, which have been found to breed true. Mares suitable for the purpose of the experiment have been selected, but there is some difficulty in regard to stallions; with those at present available, about one-half of the progeny is expected to be of the stamp required.

REFERENCE has already been made in the public Press to the publication in the Government *Gazette* of a Bill by the Minister of Commerce of the Union of South Africa for the reform of the weights and measures of that Union. The Decimal Association has now received a copy of the Bill, and states that it represents a great advance towards the complete introduction of the metric system. The standard units of each table of weight and measure as shown in the second schedule of the Bill are those of the metric system alone, but the use of the imperial measures, with certain modifications, is permitted. The only Cape measures allowed are the rood of 12 Cape feet, their squares, and the morgen. The hundredweight is eliminated, and the cental of 100 lb. substituted; the ton is to be 2000 lb., and the carat is fixed at 205·304 mg. Section 12, subsection 3, provides that no person shall sell drugs and medicines retail by weight or measure except by measures of the metric system. It is not yet known whether the Bill has been introduced, but little, if any, opposition is expected to it, as the reform has been well discussed in the Union and the chambers of commerce have been consulted.

THE following are among the subjects of lectures to be given at the Royal Institution after Easter:—Mr. F. Balfour Browne, "Insect Distribution, with Special Reference to the British Islands"; Prof. W. Bateson, "The Study of Genetics"; Prof. W. M. Flinders Petrie, "The Formation of the Alphabet"; Prof. A. W. Crossley, "Synthetic Ammonia and Nitric Acid from the Atmosphere"; Prof. J. Norman Collie, "Recent Explorations in the Canadian Rocky Mountains"; Prof. H. T. Barnes, "The Physical and Economic Aspects of Ice Formation in Canada" (the Tyndall lectures); Prof. J. H. Poynting, "The Pressure of Waves"; Mr. Willis L. Moore, chief of the U.S. Weather Bureau, "The Development and Utilities of Meteorological Science." The Friday evening meetings will be resumed on April 19, when Mr. Alan A. Campbell-Swinton will deliver a discourse on "Electricity Supply: Past, Present, and Future." Succeeding discourses will probably be given by Sir George H. Darwin, Mr. W. C. Dampier Whetham, Prof. W. Stirling, Mr. W. Duddell, Prof. Howard T. Barnes, Sir William Macewen, and other gentlemen.

WE are glad to notice that efforts are being made to form an Indian Association for the Advancement of Science, the primary object of which is to afford a medium of communication between workers in different parts of India. It is proposed to hold an

annual meeting (sectional or otherwise) in the more populous Indian towns where papers may be read and discussed, the proceedings to be published in the form of an annual report. Details are to be arranged at an early meeting in Calcutta. In a circular asking for cooperation and support for the proposal, Profs. P. S. MacMahon (Lucknow) and J. L. Simonsen (Madras) remark:—"We realise that the future of science in India depends upon the adequacy of the practical training which students receive in college laboratories, and, furthermore, that nothing is better calculated to increase its efficiency than the inculcation of research as the ultimate purpose of all scientific knowledge. It is unnecessary to point out how many and varied are the problems awaiting solution and how intimately the social and economic future of India is bound up with the successful application of scientific methods to all the activities, whether agrarian or industrial, of the community. We cordially invite the participation of Indian men of science, convinced in the belief that in such measure as it is accorded the objects of the society shall more nearly approach fulfilment and its usefulness and permanence be assured."

To *The Museums Journal* for March, Dr. Ernst Hartert communicates an illustrated account of the additions and alterations to Mr. Rothschild's museum at Tring.

WITHERBY'S *British Birds* for March contains an account of the life and writings of Thomas Muffett, an English physician and ornithologist, who died in 1604, by Mr. W. H. Mullens, who originally contributed it to the publications of the Hastings and St. Leonards Natural History Society. Muffett's chief ornithological work, "Health's Improvement," which treats primarily of food, is ascribed to the year 1595, but is known by a posthumous edition published in 1655. The author was acquainted with more than one hundred kinds of British birds.

IN his report for 1911, Captain Stanley Flower states that in October of that year the menagerie at Giza and the aquarium at Gezira contained 1761 specimens, representing 401 different forms of animals, this being the largest stock hitherto maintained at any one time. It is stated that the widely distributed tropical aquatic aroid plant, *Pistia stratiotes*, which had disappeared from Egypt for more than a century, has been rediscovered in the Delta by Prof. G. Schweinfurth. Specimens have been introduced into the Giza Gardens.

WHEN the South American marsupial genus Cœnolestes was established in 1895 by Mr. O. Thomas it was referred to the diprotodont section of the order. In 1909 Miss P. H. Dederer pointed out that it showed so many polyprotodont resemblances as to preclude its reference to the former group, and it was accordingly made the type of a new suborder, Paucituberculata. Dr. R. Broom (Proc. Linn. Soc. N.S. Wales, vol. xxxvi., p. 315) disputes this view, and regards the diprotodont lower dentition (like the front teeth of the aye-aye) as of no taxonomic importance, and consequently includes the genus in the Polyprotodontia, regarding it as a specialised relative of the American opossums.

IN the Transactions of the Bristol and Gloucestershire Archæological Society, vol. xxxiv., part i., for 1911, Mr. J. E. Pritchard announces the discovery in a Bristol excavation of the skull of an ancient type of horse. Prof. J. Cossar Ewart, on examination of the specimen, reports that it belongs to a small, slender-limbed horse or pony of the "plateau" type. Slender-limbed horses of an apparently similar class occurred as a wild species during Pliocene times in Italy and France, and others lived in Europe during the Neolithic, Bronze, and La Tene periods. Remains of similar horses have been found in Kent's Cavern, Torquay, and a nearly complete skeleton of this "plateau" type was found in the Roman fort of Newstead, near Melrose. An example of the same kind, unearthed by the Rev. Dr. Irving at Bishop's Stortford, was described by him at the last meeting of the British Association held at Portsmouth.

The Quarterly Journal of Microscopical Science for February (vol. lvii., part iii.) contains a useful account by Miss Freda Bage of the histological structure of the retina in the lateral eyes of Sphenodon (Hatteria). She finds that the retina agrees closely in structure with that of other reptiles, and that the sense cells consist of cones only, which may be either single cones or double cones. The structure of these cones is very complex, and is described in detail.

THREE years ago considerable interest was aroused among students of reproduction problems by Dr. Guthrie's announcement that he had succeeded in transplanting ovaries from black to white hens, and *vice versâ*, with certain interesting effects on the offspring. The experiments have been repeated by C. B. Davenport, of the Carnegie Institution at Washington's station for experimental evolution, and published in *The Journal of Morphology* (vol. xxii., No. 1), but no evidence could be obtained that the engrafted ovary ever became functional. It was concluded that regeneration of the extirpated ovary took place, followed by the production of abundance of eggs.

FROM an announcement in *The Journal of the Board of Agriculture* (vol. xviii., No. 8) we learn that the Board has arranged for the continuation of the experiments carried on privately for many years by Mr. Elliot at Clifton-on-Bowmont. The soil is poor, very stony, and liable to deteriorate unless skilfully managed. Owing to its dryness, it suffers severely from drought; it can, in fact, by no ordinary system of farming be made profitable. Mr. Elliot's method was to plough up the herbage and to sow a new lot of plants capable of resisting drought; after many trials a mixture was devised suited to the conditions, and also bringing in profit. It contains cocksfoot, fescue, tall oat grass, and such drought-resisting plants as yarrow, kidney vetch, chicory, and burnet. After four or five years this mixture can be followed by arable crops. If the scheme proves profitable on further investigation, it will be of great value in agriculture.

AN interesting paper in *The Agricultural Journal of India* (part vi., vol. iv.) deals with the manufacture of palm sugar in Upper Burma. Both the male and the female trees are tapped for their juice from the time the first flowers appear until late in the year, *i.e.* about eight months. The juice is boiled down to a syrupy state, is then allowed to cool, and rolled into balls, which are exposed to the sun to dry. The methods, needless to say, are very wasteful, and necessitate a large consumption of wood for fuel, which for centuries has led to indiscriminate forest cutting. There is evidence to show that dense virgin forests stood in the past where only sun-burned arid areas now are, and unless the timber wasting is stopped serious results are bound to follow.

WE are in receipt of part ii. of Mr. J. H. Holland's "Useful Plants of Nigeria." Part i. was noticed in NATURE for December 30, 1909, where the scope of the work was described in detail, and the importance of the natural resources of that country was alluded to. The present part covers the natural orders from Connaraceæ to Araliaceæ, and includes, therefore, the order Leguminosæ. For variety of economic products this order can hardly be surpassed. Foodstuffs, timbers, dyes, drugs, gums, and resins are those which are of most importance to Nigeria. The work, which is published as "Additional Series IX." to *The Kew Bulletin*, is not only invaluable to those interested in Nigeria, but contains a wealth of information for all engaged in the study of economic products of this nature.

DR. G. PLATANIA contributes an interesting paper on the oscillations of the sea on the coasts of Sicily to the last number of the *Bollettino* of the Italian Seismological Society (vol. xv., pp. 223–72). These oscillations, which are known by the name of *marrobbio* in the district referred to, were made the subject of simultaneous observations at various places in Sicily during the months of April and May, 1905, and more recently at several stations, and especially at Mazzara on the western coast. The oscillations vary greatly in amplitude, sometimes exceeding the total range of the semi-diurnal tide. The periods are also very variable, those at Mazzara ranging about the values 10–18 and 21–26 minutes, the smaller average agreeing fairly with the period of oscillation in the open bay. The occurrence of the *marrobbio* seems to depend on the existence of a cyclonic distribution of atmospheric pressure in the neighbourhood of the Sicilian coasts.

IN *The Geographical Journal* for March, Prof. H. Bingham, the director of the Yale Peruvian Expedition, describes the results obtained. Careful topographical work was done in surveying a series of areas on large scales from 1 : 4500 to 1 : 3600, with the necessary contour lines. Lake Parinacochas was also surveyed, and the altitude of Mount Coropuna determined by triangulation. A considerable amount of geological and physiographical work was accomplished, furnishing evidence of past climatic changes and of a complex history for the coastal terraces, showing that a submergence took place in Tertiary times and that a later erosion is still in progress. Human bones were found near Cuzco buried under 75 ft. of gravel, and the conclusion was arrived at that they were interstratified with this deposit. The object of the expedition was primarily to reconnoitre the region, and other expeditions to follow up the more important discoveries are contemplated.

THE summary of the weather issued by the Meteorological Office for the week ending March 16 shows that for the fifth week in succession the mean temperature was in excess of the average over the entire area of the United Kingdom. The excess was decidedly less than in some of the preceding weeks, although it amounted to 4° in the east of England, and was nowhere less than 2°. The excess of temperature, as almost continuously throughout the past winter, was due to a persistent southerly wind from off the Atlantic. The rains last week were generally less heavy than of late, although the amount was in excess of the average over nearly the entire kingdom. At Greenwich the thermometer in the shade registered 61° on March 14, which is 12° above the average for the season, and is as high as in any previous year on the corresponding day since 1841.

TO the Journal of the Meteorological Society of Japan for November last, Prof. T. Okada contributes an article entitled "Geometrical Constructions for Finding the Motion of a Cyclone by Observing the Shift of Wind," in which the law of wind gyration during the passage of a storm is rendered in a more definite form, based upon the following two assumptions, neither of which may be strictly true :—(1) that the angle between the direction of the wind and the gradient is constant in the cyclonic region under consideration; (2) that the cyclonic centre is making a uniform rectilinear motion during the interval of time under consideration. The solutions of the problems which are given for cases when a ship has come to a standstill or is moving are useful and interesting; at the same time, we think that captains of vessels would prefer to adhere strictly to the ordinary rules laid down in their handbooks, which have been carefully drawn up by the Admiralty and others for dealing with storms in all circumstances.

ATTENTION has been directed to a somewhat unfortunate omission in the review by Prof. Bryan of the Bulletin of the Calcutta Mathematical Society (NATURE, February 29, p. 583) which appears to overlook the valuable collections of abstracts published in Europe in the *Jahrbuch über die Fortschritte der Mathematik*, the *Revue semestrielle*, and, we may add, the International Catalogue of Scientific Literature. While regretting this oversight, the reviewer still thinks that an opening exists for a journal published regularly, and at frequent intervals, giving an up-to-date summary of what is happening in the mathematical world in the smallest possible compass, and modelled largely on the journal described. Annuals like the *Jahrbuch* in no way meet this want.

A NEW determination of the atomic weight of radium has been made recently by Dr. O. Hönigschmid, of Vienna, who had at his disposal 1·5 grams

of radium chloride, that is, about four times the amount which has previously been available. He purified his salt by fractional crystallisation from dilute nitric acid, the method worked out by Mme. Curie. He took, however, certain precautions not taken by Mme. Curie, both in the purification and in the subsequent analysis by precipitation with silver nitrate. On the basis of 107·88 for silver, he arrives at the result 225·95, with a possible error of 0·02. Dr. Hönigschmid's paper forms No. 7 of the *Mitteilungen aus dem Institut für Radiumforschung*, of Vienna.

WE have received a pamphlet containing an account of a new laboratory for experiments on radio-active substances which has been opened at Gif, Seine-et-Oise, under the direction of M. Jacques Danne, editor of *Le Radium*. The laboratory, which is private in character, has been arranged to provide facilities for commercial and scientific work on radio-active minerals and products, and to provide the necessary apparatus and instruction for those who wish to acquire a practical knowledge of radio-active methods and their application. In addition, it will be available for investigation both in the theoretical and commercial side of radio-activity. The laboratory is conveniently situated in a retired spot about 206 kilometres from Paris, and consists of a number of detached buildings, including a laboratory for chemical and physical work on radio-active substances, another for research and practical instruction, and also a library and administrative offices. Photographs are given of the various buildings and the interior of some of the laboratories, which appear to be well equipped for the work proposed. The laboratory has been designed to supplement the work of university laboratories and radium institutes, and no doubt will prove of value especially in connection with the commercial side of radio-activity. The creation of this laboratory illustrates the increasing technical as well as scientific importance of the rapidly growing subject of radio-activity. All communications are to be addressed to the director of the laboratory at Gif, or at his office, 91 Rue Denfert-Rochereau, Paris.

As the result of their measurement of the expansion of mercury, Prof. Callendar and Mr. Moss in their recent paper before the Royal Society gave the value of the mean coefficient of dilatation between 0° and 100° C. as $182{\cdot}05 \times 10^{-6}$. As this result differs from the value $182{\cdot}54 \times 10^{-6}$ obtained by Dr. Chappuis at the Bureau international des Poids et Mésures, they express the opinion that it is not safe to take the coefficient of cubical expansion of the material of a containing vessel as three times the linear coefficient, which Chappuis had done. In the *Verhandlungen der Deutschen Physikalischen Gesellschaft* for February 15 Drs. Scheel and Heuse, of the Reichsanstalt, show that the results of Chappuis for both water and mercury agree with those obtained at the Reichsanstalt, and they are disposed to think that some error has crept into the measurements of Callendar and Moss. They support this view by reference to Harlow's measurements of the expansion of fused silica. When these are based on the results of Callendar and Moss they differ from, and when based on the older results they agree with, those of other observers.

THE Bausch and Lomb Optical Company has forwarded to us specimens of their new and improved models of microscopes produced at the beginning of the present year. This American firm is well known for first-class work, and its association with the Carl Zeiss optical works at Jena, with which it exchanges ideas and experiments, gives it great opportunities and standing; the various improvements it has effected, together with reduction in prices, will therefore be of interest to all users of the microscope. The type of instrument is Continental rather than British; there is no centring of the substage for bright field illumination, although the dark field is provided for in this respect. We note the presence of provision for oblique illumination, the absence of which generally in our English stands is regretted by some. Messrs. Bausch and Lomb do not catalogue apochromatic objectives, but, as was to be expected, their association with the Jena glass works enables them to produce achromatics of excellent quality, penetration and minimum of colour being their characteristics. It is worthy of note that they obtain these results without using fluorite. Some of the smaller instruments are marvels of cheapness, and great choice of fittings is given. We direct special attention to the mechanical stage provided for fixing to a square stage; it is one of the cheapest and most convenient we have seen, the screws being in close juxtaposition. The pamphlet on the use and care of the microscope issued with each instrument is admirably written and is full of suggestions of value to the beginner.

IN continuation of their well-known experiments on photochemical action, Profs. Ciamician and Silber describe in the *Atti dei Lincei* (vol. xx., p. 673) a number of striking cases of oxidation of aromatic hydrocarbons brought about by sunlight and gaseous oxygen in presence of water. Toluene, the three xylenes, and cymene, when mixed with water and exposed in large flasks or bottles to the action of the gas in bright sunlight during several months, give rise to the corresponding carboxylic acids, toluene forming benzoic acid and the xylenes the corresponding toluic acids; the yield in some cases was as high as 30–40 per cent. of the theoretical quantity. Small quantities of the dicarboxylic acids are also formed in the case of the xylenes, metaxylene, for instance, yielding isophthalic acid. *p*-Cymene gave rise principally to paracumic acid, $C_3H_7.C_6H_4.CO_2H$, but the interesting compound $(CH_3)_2C.(OH).C_6H_4.CO_2H$ was also formed, together with its product of dehydration, $C_3H_5.C_6H_4.CO_2H$. It is noteworthy that *ortho*- and *para*-nitrotoluenes remain unchanged when exposed to the action of moist oxygen under similar conditions, without giving rise to more than traces of acid.

A USEFUL addition is made to our knowledge of the strength of reinforced concrete piles in an article in *Engineering* for March 15. The author, Mr. F. H.

Jeffree, considers the strength of the pile to resist the various handling processes it has to undergo before being finally driven. From the diagrams given, the pile is subjected to a maximum bending moment of $W(L-8)^2/8$ in.-lb., where W is the weight of the pile in lb. per inch run, and L is its length in inches. Expressions are given for the moment of resistance for the pile lying on the flat and also for one diagonal of the section vertical. As reliance is placed on the continuity of the concrete to protect the steel from corrosion, the author proposes to limit the stress on the steel to 20,000 lb. per square inch before driving the pile. Hair cracks in the concrete will thus be avoided. The article closes with a useful table giving the section moduli and limits of safe length for piles from 10 to 16 in. square with various amounts of reinforcement in which the above-mentioned conditions are fulfilled.

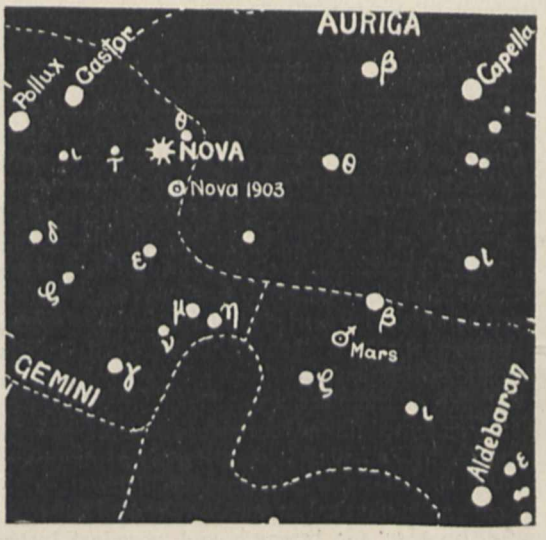
THE interest taken in the development of the Diesel engine was evidenced by the very large attendance at the Institution of Mechanical Engineers on Friday, March 15, when a paper was read by Dr. Rudolph Diesel. The author considers that England has the greatest interest in replacing the coal-wasting steam engine by the Diesel engine, as enormous savings can be thus effected in her most valuable treasure—coal. As tar and tar oils are from three to five times better utilised in the Diesel engine than coal in the steam engine, a more economical way of using coal is obtained if, instead of being burnt in boiler furnaces, it is first converted into coke and tar by distillation. Coke is useful for metallurgical and other general heating purposes; from a part of the tar the valuable by-products are first extracted, and undergo further processes in the chemical industry, whilst the tar-oils and combustible by-products, together with a great part of the tar itself, are burned in the Diesel engine under extraordinarily favourable conditions. For river vessels in the colonies, the Diesel engine is very suitable. Questions regarding the limiting dimensions of cylinders, influenced by the strength of the metal and by the heat produced, were raised in the discussion.

A LIST of the publications of the Carnegie Institution of Washington has been received. Copies of each publication, except the "Index Medicus," are sent gratuitously to a limited list of the greater libraries of the world, while the remainder of the edition is on sale at a price sufficient only to cover the cost of publication and carriage to purchasers. Brief descriptions of the contents of the more important volumes add greatly to the value of the catalogue.

OUR ASTRONOMICAL COLUMN.

NOVA GEMINORUM NO. 2.—A second telegram, which arrived from Kiel too late for us to publish the correction last week, announces that Herr Enebo's new star is near θ, not η, Geminorum. The new position, being at a greater altitude, is better for observation than the earlier one, and on March 15 the nova was quite easily found a little to the south and east of θ Geminorum; the accompanying chart shows, approximately, the position, and also that of Nova Geminorum No. 1, discovered photographically by Prof. Turner in 1903.

Greenwich measures made on March 15 give the position as 6h. 49m. 14s., +32° 15′. Photographs of the spectrum show the hydrogen lines, both dark and bright, with other bright lines, and the magnitude was estimated as about 4·0; observations made independently at Chichester and Birmingham show that the star, later on March 15, was fainter than the fourth magnitude. Later observations, by several



observers, show that by Monday night the star was certainly fainter than magnitude 5.

We learn from Prof. Fowler that a spectrum secured during a short, clear interval on Friday night, at the Imperial College of Science, shows the spectrum to be similar to those of Novæ Persei and Aurigæ in the earlier stages. Although the dispersion is small, the bright and dark hydrogen series are easily seen.

OBSERVATIONS OF MARS.—With the 10-in. refractor of the Urania Observatory, Herren Janssen and Andersen made a number of observations of Mars during the months September to December, 1911. An eosin-red glass was at times employed to accentuate the contrast between the different parts of the planet's surface. While the "coastlines" generally were very well defined, the islands in the "Südmeere" were very pale; the details of the observations are shown on a chart accompanying the paper in No. 4561 of the *Astronomische Nachrichten*. Twenty-nine "canals" were seen, but none was seen doubled.

THE CONSTITUTION OF THE RING NEBULA IN LYRA.—In a paper recently communicated to the Heidelberg Academy, Prof. Max Wolf finds that certain radiations are emitted only by well-defined portions of the Ring Nebula, the line λ 4686 arising solely from the central dark space, while the line λ 3729 occurs chiefly towards the outer edge of the bright ring; this differentiates these two radiations from the others in the nebular spectrum, and, according to Prof. Wolf, probably denotes different substances with widely differing atomic weights. Dr. Nicholson's failure to account for these two lines in his recent theoretical discussions of the spectrum of the hypothetical substance "nebulium" consequently affords no indication that his theory is untenable.

THE NATIONAL PHYSICAL LABORATORY DURING 1911.

THE annual meeting of the General Board of the National Physical Laboratory was held at Teddington on Friday last, March 15. As usual, a large number of visitors were invited to view the Laboratory, and were received by Sir Archibald Geikie, president of the Royal Society and chairman of the general board, and by Lord Rayleigh, the chairman of the executive committee. The visitors were glad to see that the director, Dr. Glazebrook, was sufficiently recovered, after his recent illness, to be able to take part in the proceedings.

The continued development of the work of the laboratory has been well maintained during the past year. The William Froude National Tank was formally opened in July last. The Wernher building, erected, as its commemorative tablet states, by Sir Julius Wernher to advance the science of metallurgy, was completed in the autumn. A new laboratory has been provided, under a scheme approved by H.M. Treasury, to carry out tests for the Road Board on road materials and on experimental road-tracks. Other new buildings are now in course of erection.

It was explained in the report of the Laboratory for the year 1910 that the control of the meteorological work carried out at the Kew Observatory had been transferred to the Meteorological Office. The testing of thermometers, telescopes, watches, and other instruments previously carried on at Kew—the observatory department of the Laboratory—was to be continued there until the necessary accommodation could be provided for the removal of the work to Teddington. The further buildings now under construction will enable this transference to be made. They include an optics section, which will provide space for all the optical work now carried out at Kew and Teddington, leaving room in Bushy House for other portions of the Kew work; and an administration building, with offices, library, &c., and a section for the receipt and despatch of instruments. The need for such a building had become imperative, owing to the great increase in the activities of the Laboratory.

Towards the cost of these new buildings the Treasury will contribute the sum of 15,000*l*. The committee in its report explains that an additional sum of about 10,000*l*. will be necessary for the satisfactory equipment of the buildings, and expresses confidence that the appreciation shown in the past of the national work done by the Laboratory will be continued, and that the help needed will be readily forthcoming.

The most interesting addition to the equipment completed during the past year, and shown in operation on Friday last, is the Lorenz apparatus for the determination of the ohm in absolute measure. Some particulars of this have been given previously. Much attention has been devoted recently to the elimination of the thermal electromotive force at the brush contacts, and with the form of brush finally adopted—annealed phosphor-bronze wires stretched as a bow-string and pressed on the circumferences of the discs—it is found that the desired result has been obtained. A further difficulty, the determination, with the high accuracy necessary, of the distance between the equatorial planes of the coils, has been met by a special device. A light tubular magnet is suspended from an agate knife edge resting in an agate **V**, and swings like a pendulum; its rest-point can be determined as for a weighing balance. This magnetic pendulum is placed inside a coil, and the position for which there is no axial displacement when a current is passed through the coil can be observed within about three thousandths of a millimetre. This method promises to be very accurate, and will appreciably lighten the work of obtaining the measurements. The first determinations of the ohm with the apparatus will, it is hoped, be made very shortly.

An entirely independent method of evaluation of the ohm in absolute measure has been applied by Mr. Campbell. This is one of several methods he has suggested for the comparison of resistance with mutual inductance. An auxiliary condenser is tested against a resistance by Maxwell's commutator method and against a standard mutual inductance and two resistances by Carey Foster's method, the results giving the ohm in terms of the mutual inductance, the value of which is calculated from its dimensions. Though not aiming at so high an accuracy as it is hoped may be attained with the Lorenz apparatus, the method appears to yield very good results.

The photometry division has completed an interesting research on the visibility of point sources of light. The investigation was undertaken, at the request of the Board of Trade, in connection with the certification of ships' lights, which at a distance of two miles are seen simply as bright points of no perceptible angular magnitude. The unit of visible intensity adopted for comparison purposes is that of a point source of one-millionth of a candle-power one metre distant from the eye; this unit approaches the limit of visibility. An important point investigated was an apparently anomalous dimming of lights observed in the case of some persons using spectacles, which was found to be due to the chromatic aberration of the eye.

In the course of the research on the fundamental high-temperature scale in the thermometry division some interesting ionisation phenomena have been met with, recently described before the Royal Society by Dr. Harker and Dr. Kaye. The division has also taken up the determination of the thermal conductivities of heat insulators as used for cold-storage purposes, a subject of much practical importance.

The metrology division has been largely occupied with the necessary work involved in the maintenance of standards, and with test work. The behaviour of the new silica standard metre is being very carefully followed. As in previous years, a number of investigations have been carried out for the Engineering Standards Committee.

In the engineering department a large number of interesting investigations have been completed. Dr. Stanton's research on the effect of wind pressure on structures has been proceeding continuously almost since the date of the opening of the laboratory. The object of the work has been to enable a trustworthy prediction of the wind pressure on a large engineering structure to be made from laboratory experiments on a small model of the structure. The earlier parts of the work were concerned with experiments on small models in an air channel, which were compared later with the results of observations on larger structures in the natural wind. Following this, an attempt has been made to ascertain whether a trustworthy estimate of the total wind pressure over a large structure can be obtained from observations at one point. This work has recently been completed, and it is considered that sufficient data have been obtained to enable a prediction of the wind pressure over an area of several thousand square feet to be made from observations at a single point in the area. There remains the investigation of the more or less exposed nature of the site on the lateral variation of wind-force. For this purpose, permission has been received to make the observations on the Tower Bridge, and this work will be commenced shortly.

The work of the aëronautics division has made good progress; in particular the study of the best forms of aëroplane surfaces, and of the distribution of flow round such surfaces, has been greatly advanced. An opportunity of describing this work will arise later, on the issue of the annual report of the Advisory Committee for Aëronautics.

The metallurgy department was occupied for some considerable time during the autumn with the transference to the new Wernher building. The principal item of research work has been the investigation of the aluminium-zinc alloys, carried out for the Alloys Research Committee of the Institution of Mechanical Engineers.

Mr. Baker, the superintendent of the William Froude National Tank, has carried out a number of investigations, some of which have been already described in these pages. Careful comparisons have been made with Mr. Froude's results at Haslar by tests on models to lines supplied by him, and experiments have also been carried out with a model similar to others tested at Clydebank and Washington. These tests have shown satisfactory agreement, and the national tank is now ready to go forward with general experimental investigations of ship resistances.

In this short summary it is impossible to do more than touch on the many points of interest presented by the work of the laboratory. Enough, however, has been said to show that the laboratory continues fully to justify the appreciation which the great manufacturing firms of the country have displayed of its value to industry.

OZONE AND VENTILATION.

THE Journal of the Society of Arts of February 9 contains a paper by Messrs. Leonard Hill and Martin Flack on "The Influence of Ozone in Ventilation." The authors point out that whilst it is not legally permissible for the carbonic anhydride in the air of a factory to exceed a few parts per 1,000, no harm whatever is caused by breathing air containing up to 4 per cent. of this gas. A similar statement applies to deficiency of oxygen, which does not become important until the proportion falls to 14 or 15 per cent. These conclusions are quite in accord with the fact that, on account of the dead-space separating the lungs themselves from the open air about one-third of the air drawn into the lungs is re-breathed; it is thus quite impossible that a few parts per thousand of carbonic anhydride in the outside air should affect the lungs, in which the percentage is normally about 5 per cent.

Another theory of the ill-effects of bad ventilation is the supposed liberation of organic poisons. This also is probably fictitious, as animals will live and thrive when supplied exclusively with air already breathed by other animals, and containing 3½ per cent. of carbonic anhydride; they are liable to die of suffocation if the air supply is interrupted, or if the percentage of carbonic anhydride rises to 10 to 12 per cent. As an explanation of the discomfort arising from lack of ventilation the authors suggest: (1) the stagnation of the air, resulting in diminished evaporation from the skin, and a consequent sensation of lassitude; (2) the nausea caused by the odour emitted from an imperfectly washed crowd. The value of ozone in ventilation depends largely upon its power of removing this odour; sterilisation is perhaps less important as expired air is practically sterile; infection is conveyed by droplets of saliva, which cannot be removed by ventilation, but soon settle, and may be removed when the room is dusted.

LA HOUILLE BLANCHE.[1]

THE work of the French "Direction de l'Hydraulique" has already been the subject of two articles in these columns (May 7, 1908, and November 25, 1909). On both occasions a tribute was paid to the very effective and thorough manner in which the department was carrying out its systematic investigation into the hydraulic reserves of the mountain ranges of France. The volume now under review is the fourth of the series, and it sustains the favourable impression created by its predecessors. It brings the record of observations down to the end of 1910, completing a period of very nearly eight years since the inception of the department. The service, in so far as it relates to the region of the Alps (which is the only range at present under observation, though the extension of the work to the Pyrenees is impending), is now concentrated under the direction of M. R. de la Brosse, whose former coadjutor, M. R. Tavernier, has become Inspecteur général de l'Hydraulique agricole.

The area of country comprised within the purview of the inquiry amounts to 22,000 square miles, and lies immediately to the south of the Lake of Geneva, extending to the shores of the Mediterranean, and being bounded on the east and west, respectively, by the Italian frontier and the river Rhone. The principal basins are those formed by the tributaries of the Rhone on its left bank between Geneva and the sea, the most noteworthy being the Isère, the Durance, the Var, the Arve, and the Dranse. Gauging stations to the number of 180 have been established in suitable localities, and the total number of gaugings carried out to December 31, 1910, was 3116, of which 726 represent the work of the last twelve months. The greatest number of records taken at any one station amounted to fifty-nine, and the mean for the whole was seventeen.

From the observations two factors, or coefficients, have been deduced. First the mean characteristic discharge, which represents the minimum guaranteed for half the year; and, secondly, the modulus, or arithmetical mean of the discharges corresponding to the daily level. The former of these factors is valuable in computing the industrial trustworthiness of a stream, and the second is an important element in connection with regularisation works. As an instance may be taken the case of the Durance at Rousset, where, during the five years 1905–9, the records show a variation in discharge between 18 and 440 cubic metres per second, giving as mean figures for the whole period a low-water discharge of 20 cubic metres per second, a modulus of 68, and a total annual volume of 2,138,000,000 cubic metres. The mean characteristic discharge, *i.e.*, the minimum on which it is possible to reckon during half the time, is about 46 cubic metres per second.

The motive power in the French alpine region actually harnessed at the present time amounts to 473,000 h.p., dvided approximately as follows:—Metallurgy, 210,000; power and light distribution, 155,000; chemical products, 60,000; paper, cardboard, &c., factories, 30,000; electric traction, 10,000; miscellaneous, 8,000. Other schemes are now projected which will shortly raise the total to something in the neighbourhood of 2,000,000 h.p.

The volume contains one or two useful essays by individual contributors on technical matters connected with the taking of observations, and there are several interesting photographs. Then follows part ii., which

1 Service des Grandes Forces Hydrauliques (Région des Alpes). Compte Rendu et Résultats des Études et Travaux au 31 Décembre, 1910. Tome iv., pp. 556. Annexe i., Cartes, pp. 14+8 cartes; Annexe ii., Nivellements, 33 planches. (Ministère de l'Agriculture, Direction de l'Hydraulique et des Améliorations Agricoles, 1911.)

constitutes by far the bulk of the work, being a tabulation of the numerical readings taken at successive dates throughout the year at the different stations.

There are two "Annexes." The first is a series of charts showing the disposition and extent of the various factories and works where hydraulic power is turned to account, and the second is a series of longitudinal sections, or profiles, of the watercourses of the Isère and the Arc.

All are admirably prepared, and give rise to the reflection that some things are done much better abroad than they are at home. Our own country stands out in "splendid isolation" in possessing no hydrological service and in making no official attempt whatever to catalogue, define, and conserve her natural resources of water power and supply, now running to waste or liable to misappropriation. In this attitude she finds no sympathy or support from her neighbour across the Channel, nor from the United States, nor Italy, nor Switzerland. Each of these countries has realised the advantages accruing to trade, agriculture, and the public welfare generally from a systematic development and control of La Houille Blanche.

POETRY AND SCIENCE.

THE Professor of Poetry at the University of Oxford, Dr. T. Herbert Warren, President of Magdalen College, gave a public lecture on March 2 on the subject of "Poetry and Science." He began by quoting his predecessor Matthew Arnold, who wrote on New Year's Day, 1882: "If I live to be eighty, I shall probably be the only person left in England who reads anything but newspapers and scientific publications."

Has Matthew Arnold's gloomy prophecy been fulfilled? Have newspapers and science killed real literature? In particular, are the interests of science hostile to the interests of literature?

Where science has dominated, has poetry languished? This is a very burning question, for science has certainly made great advances. It impresses the man in the street, chiefly by its usefulness. It is the poet and the poetic person who are impressed by the marvel, the magic, and the mystery of science. Matthew Arnold inherited the tradition of Wordsworth, who was a great poet of Nature, but not a poet of Natural Science. He strove hard to do justice to it, both in his prose prefaces and in his poetry, but with imperfect success. Wordsworth's poem "The Poet's Epitaph" contains a most beautiful and memorable description of the poet, but is scarcely fair to the man of science, who is generally a man also of natural affections. The man of science may be as fond of his mother as the poet, who is often one of the most selfish of beings, and if he would not "botanise upon his mother's grave" because he knows no botany might be quite capable of turning her into copy.

Further, the poet is not "contented to enjoy the things that others understand." He must synthesise in his own way. Wordsworth himself was for ever philosophising and moralising.

Keats, again, is often cited as complaining that Newton had destroyed the beauty of the rainbow by reducing it to prismatic colours, but Keats was perhaps not serious in this charge.

Goethe, on the other hand, did not object to Newton for reducing the rainbow to prismatic colours, but only for doing so wrongly.

Matthew Arnold "poked fun" at science as he did at religion, and was even less willing to treat it seriously than religion. He was often exceedingly amusing, and his famous description of a scientific education in "Friendship's Garland" was highly so.

Darwin, who began by being a great lover of poetry, thought that in later days he had lost the power through atrophy, but in point of fact the atrophy was by no means complete. He remained a most poetical writer. The closing paragraphs of the "Origin of Species" were worthy of Lucretius, which they strongly resembled.

History shows that poetry, philosophy, and science had all begun life together as children of one family. The early Greek poets, like the authors of the Books of Genesis and Job, dealt with the origin of things and the Story of Creation. The early thinkers who succeeded them expressed their thoughts in verse, and were often highly poetical. What could be more poetical than the "dark" science of Heraclitus? The same relation was maintained through Greek literature. The greatest astronomer of antiquity, the inventor of the Ptolemaic system, was the author of a beautiful epigram which was truly poetic. From Greece and Alexandria, science and poetry passed together to Rome, and might be found combined in Lucretius and Virgil. The greatest singers of antiquity were the most alive to science. Modern literature shows the same phenomenon in Dante and in Milton and in Tennyson. This is specially well brought out in a book by a living man of science, Sir Norman Lockyer's "Tennyson as a Student of Nature." On the last of the three poets Sir Oliver Lodge has also written briefly, but with rare force, in the recent volume "Tennyson and his Friends."

As time has gone on, the scientific spirit has increasingly made itself felt in poetry, and may be seen in the works of F. W. H. Myers and his brother, in the late Duke of Argyll, in George Romanes, in Richard Watson Dixon, and still better in his friend and editor, Mr. Robert Bridges. And others of the earlier poets had also been acquainted with science, notably Gray and Shelley.

With regard to the greatest of all, if Bacon wrote Shakespeare it is odd that Bacon's science does not appear more often in the plays, but in any case it may be remembered that Bacon wrote poetry of his own and had a place in the "Golden Treasury."

Other lands and literatures too have had their scientific poets, the most famous being Goethe, of whom the best account is to be found in the popular lectures of a most poetical man of science, Helmholtz. I can speak at length only of one, the French poet of the last century, Sully Prudhomme, who combined science, philosophy, and poetry. The best account of him is to be found in the study by M. Zyromski. "Poetry," said Sully Prudhomme, "is not only the lyrical outburst of our sentiments. The great poetry has noble destinies, and will sing the conquests of science and the synthesis of thought."

The average man does not care for "great poetry," or only for that part of it which appeals directly to his own feelings. Just now, what Sully Prudhomme calls *lyrisme*, that is, personal poetry, holds the field, but that has not always been so, and will not always be so. Science has not destroyed poetry. Cambridge, the University of Science, has been the University of Poetry, and with the revival of Science at Oxford in the last century, beginning in Shelley's time, poetry revived too. The really great poet must respond to the main and moving interests and influences of his day. The old facts and factors, the old *motifs*, do not change. Rebekah at the Well, David's lament over Saul and Jonathan, Hector and Andromache, Catullus at his brother's grave, still move us. But while these remain, our outlook on the world does gradually change, as Sully Prudhomme foretold in his fine sonnet to "The Poets of

the Future." Science will certainly go on, and scholarship and poetry will go on at its side and beneath its ægis. The "scientific use of the imagination" on which Tyndall, that most poetic man of science, discoursed so finely forty years ago will be balanced more and more by the imaginative use of science.

The famous epigram by Ptolemy, the author of the Ptolemaic system, with the Professor's version of it, may conclude the address:—

ΠΤΟΛΕΜΑΙΟΥ.

Οἶδ' ὅτι θνατὸς ἐγὼ καὶ ἐφάμερος· ἀλλ' ὅταν ἄστρων
μαστεύω πυκινὰς ἀμφιδρόμους ἕλικας
οὐκέτ' ἐπιψαύω γαίης ποσίν, ἀλλὰ παρ' αὐτῷ
Ζανὶ θεοτρεφέος πίμπλαμαι ἀμβροσίης.

I know that I am mortal, and doomed to fleeting days,
But when I track the circling stars in myriad-orbèd maze,
I tread the earth no more, but sit beside the Lord of Heaven,
And taste the ambrosial food whereby the life of Gods is given.

CIVIL SERVICE ESTIMATES FOR SCIENCE AND EDUCATION.

THE Estimates for Civil Services for the year ending March 31, 1913, are being issued as a series of Parliamentary Papers. The following particulars referring to the money under this vote 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, &c.," we find that the amount of the grants in aid for 1912–13 is 125,523*l.*, which represents a net increase over the total for 1911–12 of 61,920*l.* This considerable advance is explained largely by the increase of 29,500*l.* in the grant to the National Library of Wales and of 31,000*l.* to the National Museum of Wales.

The grants in aid enumerated under the heading of the Royal Society, and voted for scientific investigations and scientific publications, for the expenses of the Magnetic Observatory at Eskdalemuir, and for salaries and other general expenses of the National Physical Laboratory, remain as in 1911–12; the grant in aid of the expenses of the aëronautical section of the National Physical Laboratory, however, has been increased from 4885*l.* to 5775*l.* The total grants in aid under all these headings reach 23,775*l.*

The grant to the Meteorological Office has been increased from 16,850*l.* to 17,000*l.*, and that of the Royal Geographical Society from 500*l.* to 1250*l.* The Edinburgh University will receive 1728*l.*, as compared with 1508*l.* in 1911–12, and the International Seismic Association 370*l.*, as compared with 210*l.*

The Estimate for Universities and Colleges, Great Britain, and Intermediate Education, Wales, amounts to 314,200*l.*, an increase of 10,400*l.* over that for 1911–12. The total for universities and colleges is 287,000*l.*, an increase of 10,500*l.*, which all goes to Scottish universities.

The vote for Science and Art in Ireland reaches 138,591*l.*, as compared with 117,883*l.* in 1911–12, 30,600*l.* of the increase being accounted for by larger annual grants to schools and classes of science, art, and technical instruction. The estimate of the amount required for grants under the Irish Universities Act, 1908, is 130,000*l.*, or a decrease of 56,256*l.* on 1911–12.

The estimate of the amount required to pay the salaries and expenses of the Board of Education and of the establishments connected therewith is 14,504,765*l.*, allocated, so far as the chief items are concerned, as follows:—administration, 202,333*l.*; inspection and examination, 249,633*l.*; elementary schools, 11,832,235*l.*; training of teachers, 603,000*l.*; secondary education, 756,000*l.*; technical institutions, evening schools, &c., 621,800*l.*; universities in respect of technological work, 42,000*l.*; Imperial College of Science and Technology, 20,000*l.*; Science Museum, 18,018*l.*; Geological Museum, 3694*l.*; Geological Survey of Great Britain, 17,644*l.*; and Committee on Solar Physics, 2171*l.*

THE GYROSTATIC COMPASS AND PRACTICAL APPLICATIONS OF GYROSTATS.[1]

THE problem of a *practical* gyrostatic compass has attracted the attention of many, but the credit of being the *first* to produce a practical working instrument belongs to Dr. Anschütz, who, with those associated with him, has devoted some twelve years of patient work and no inconsiderable sum of money in experiments. Since then some important work has been done by Hartmann and Braun in Germany, and Mr. Sperry in America, details of which are not available.

Few people have any idea of the difficulties attending the installation and correct adjustment of a magnetic compass on board a large steel ship, and more particularly on a battleship or cruiser, so as to work surrounded by huge masses of steel, and in order to withstand the terrific shocks caused by the firing of heavy guns, and the problem would to-day be impossible had it not been for the theoretical work of Sir George Airy, the applied genius of Lord Kelvin, and the present practical improvements introduced by the superintendent of compasses at the Admiralty.

A magnetic needle can only point in the direction of the lines of magnetic force at the place where it is set up, and it is well known that there are very few places on the globe where the magnetic needle points true north and south.

Dr. Anschütz attacked the problem of a gyrostatic compass with enthusiasm, and has continued to work at it in the face of many and great disappointments with a thoroughness and patience which is characteristic of his nationality. The construction of the compass meant new designs for everything in connection with its motors, &c. His first experiments were with gyrostats suspended with the gyro free to move about its three principal axes, or, as it is termed, having three degrees of freedom; but it is easy to show how impossible it is to construct such a gyro so as to be sensitive to small movements, and yet really accurate in practice.

To make use of the gravity effect of the earth, Dr. Anschütz mounts his gyrostat in the form of a pendulum; as the earth rotates the gyrostat tends to maintain its plane of rotation parallel to its original plane in space. The earth's gravity acts against this tendency, and a precession results, the only position of equilibrium occurring when the gyro axis has set itself parallel with the axis of rotation of the earth.

In the actual compass the friction of the universal joint carrying the pendulum arrangement must be very small for the gyro to take an ultimate position with accuracy—the length of the pendulum, and hence the effect of gravity, must be small, so as to keep the compass free from disturbances—and therefore the precession is very slow, and the compass would swing to and fro on either side of the meridian indefinitely; its mean position would, it is true, be the true north and south line, but valueless for practical use.

[1] From a Discourse delivered at the Royal Institution on Friday, February 23, 1912, by Mr. G. K. B. Elphinstone.

The sizes, weights, and speeds chosen are such as to result in a compass having many times the directive force of a magnetic compass, and therefore responding to much smaller alterations of direction than can readily be observed with a magnetic compass. The compass itself being quite non-magnetic, can be put down under armour—in a position where a magnetic compass could work only with very special precautions and under grave difficulties. The action of the contact is to control a small electric motor, which moves a plate away from the contact on the card as soon as it touches it, and then the motor stops; the motor drives a transmitting device which controls as many receivers as are wanted in the ship.

The receivers are merely electrical counters, and can be put in any position; the small dials make one complete revolution for only 10° change of course, and these are geared after the manner of clock-hands to the outer dial, one turn of which corresponds to a turn of thirty-two points, or 360°; they are arranged to turn at a quicker rate than any large ship can turn in the water. The movement which the inner card makes, for a very small alteration of course, is considerable, and takes place instantly; and, owing to this fact, enormous improvement is possible in the steering of a large ship when the helmsmen have become used to the appearance of the dials.

Attention must be paid to the necessity of corrections which have to be applied to the readings of the compass.

The first correction is an interesting one, as it is not apparent at first sight; it is common to every form of gyrostatic device which takes the earth's rotation into consideration. If a ship with a gyro compass is steaming due east or due west, the ship's speed is added to the speed of rotation of the earth in space, or deducted from it. Suppose the ship steams due north, then the resultant travel of the ship in space is along the diagonal line, as it is moving from west to east by the earth's rotation, and south to north by its own steam. Therefore it is travelling in space about some axis which it sets its own axle and its N. and S. line on the compass card, parallel to which is not the north and south axis of the earth.

The speed of the ship, the course and the latitude, come into this correction, for which tables are made out, the maximum correction which has to be considered being some 3°; for all manœuvring this correction can be neglected.

The second correction which has to be taken into account is due to the existence of the air blast used in damping, the damping checking the precession whenever this takes place. The precession varies with the cosine of the angle latitude; the air blast is constant in its effects in all latitudes, depending only on the speed of rotation of the gyro—therefore there is a varying cause and a constant retarding force, and in consequence a varying result. The effect is that for every 10° of latitude a correction of about ½° has to be applied—½° in a distance of 600 miles.

The gyro compasses in use in the British navy are adjusted to be correct at 50° north latitude, so that for all cruising in the Channel and say up to the Firth of Forth, this correction does not require consideration.

Both these corrections can be treated arithmetically by adding to or deducting from the reading on the card the same quantity *all the way round*; it does not vary in different parts of the card, as is the case when applying a deviation correction to a magnetic compass reading.

The worst difficulty which the gyro compass is faced with is the effect produced by violent rolling or great vibration in a ship. This has been receiving a great amount of attention from the inventors during the last eighteen months, since practical experience at sea showed the necessity of some improvements in this respect. Fortunately the results of the investigations have led to considerable improvement, and to a complete cure of the trouble experienced in this way, so that it will shortly be possible for gyro compasses to be installed in ships which are quite independent of the rolling motion or vibration of the vessel.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—Two important benefactions were announced last week. The first is an offer of 100,000*l.* from an anonymous friend of the University, made through Lord Haldane as chairman of the Royal Commission on University Education in London, as a contribution towards the cost of acquiring the vacant site north of the British Museum for new University headquarters. This munificent offer, announced last Friday, was followed next day by an offer from the Drapers' Company to erect a Senate House and administrative offices at an approximate cost of 60,000*l.* The offer is not explicitly associated with the site mentioned above, but it is based on the report of the Royal Commission, which suggested a building such as is indicated, together with other buildings appropriate to the site, which is divided into four plots. The Drapers' Company stipulate that the other buildings are to be provided within a reasonable time. In connection with the gift of 100,000*l.*, a board of trustees has been formed, composed of Lord Haldane, representing the Government; Lord Milner, representing the Royal Commission; Lord Rosebery, representing the University; and Sir Francis Trippel. It is stated that the donor has already done a great deal for university education, and holds that the University of London ought to be the chief educational institution of the Empire.

GLASGOW.—The Vice-Chancellor, Sir Donald MacAlister, K.C.B., has been appointed by the University to represent it at the fifth jubilee festival of the Royal Society.

The centenary of the launch of the *Comet* as a passenger steamer on the Clyde is to be celebrated during the summer. Prof. Barr, of the chair of engineering, and Prof. Biles, of the Elder chair of naval architecture, are the University representatives on the centenary committee.

Mr. J. M. F. Drummond, appointed lecturer in botany, is to have special charge of plant physiology.

The fine collection of prehistoric antiquities recently displayed in the Glasgow National Exhibition has been deposited by Mr. Ludovic Mann in the Hunterian Museum.

Proposals are under consideration for the erection within the University of a monument of the famous Glasgow brothers, John and William Hunter, the latter of whom was the founder of the Hunterian Museum.

IT is announced in *Science* that gifts of more than 100,000*l.* to the University of California have just been secured through the will of the late Mrs. Jane K. Sather, of Oakland. Plans have been begun for the Sather Campanile, a lofty bell-tower, for which Mrs. Sather provided some 40,000*l.* Two professorships are endowed, and endowment is provided for three book funds.

DR. H. L. SMITH has accepted a call to the presidency of Washington and Lee University, Lexington, Virginia, and will probably enter upon the duties of

that office in July next. Since 1901 he has been president of Davidson College, N. Carolina, where he previously held the chair of physics. He is well known in the Southern States as a lecturer on scientific and educational topics at summer schools, "Chautauquas," &c.

THE annual gathering of the South-Western Polytechnic Institute was held on Friday, March 15. The Right Hon. W. Hayes Fisher, M.P., chairman of the governing body, presided, and a report on the work of the session 1910–11 was read by the principal. The report showed that 988 students joined for work in the day and 1575 in the evening during the session, that nearly 600*l.* was gained in outside scholarships by the students, and that a large number of university and other successes had been gained. After distributing the certificates and prizes, Sir David Gill, K.C.B., F.R.S., addressed the students. He impressed on them that knowledge was the latent power of doing things, that what they gained in their classes constituted their mental tools, and that they should learn something of everything, and, above all, they should learn everything of something. He advocated the formation of a department of astronomy to include, what he considered most important, instruction in the practice of finding one's position in an unmapped country. He had met with many young engineers who were quite at a loss when they were asked to lay down a railway track in an unmapped country. The vote of thanks was proposed by Sir William White, who referred to Sir David's work on the sun's distance, and seconded by the Mayor of Chelsea. About 2400 guests attended the conversazione afterwards.

A ROYAL COMMISSION to inquire into the methods of appointment to and promotion in the Civil Service and other cognate matters has been appointed. The terms of reference are:—To inquire into and report on the methods of making appointments to and promotions in the Civil Service, including the Diplomatic and Consular Services, and the legal departments; to investigate the working and efficiency of the system of competitive examination for such appointments, and to make recommendations for any alterations or improvements in that system which may appear to be advisable; to consider whether the existing scheme of organisation meets the requirements of the Public Service, and to suggest any modifications which may be needed therein. The commission is constituted as follows:—the Lord MacDonnell, G.C.S.I., K.C.V.O. (chairman), the Duke of Devonshire, the Bishop of Southwark, Sir Henry Primrose, K.C.B., Sir Kenneth Muir-Mackenzie, G.C.B., K.C., Sir Donald Macalister, K.C.B., Sir Guy Granet, H. Baker, M.P., J. R. Clynes, M.P., S. J. G. Hoare, M.P., R. D. Holt, M.P., P. Snowden, M.P., A. A. Booth, A. Boutwood, P. E. Matheson, A. E. Shipley, Graham Wallas, Miss Haldane, and Mrs. Dean Streatfeild. The secretary to the commission is S. Armitage-Smith, of the Treasury, to whom correspondence may be addressed at Treasury Chambers, Whitehall, S.W.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 14.—Sir Archibald Geikie, K.C.B., president, in the chair.—Prof. E. **Goldmann**: A new method of examining normal and diseased tissues by means of *intra-vitam* staining. The author's original method of *intra-vitam* staining by injection of trypan and isamin blue has been greatly advanced in several points described.—Dr. E. K. **Martin**: The effects of ultra-violet rays on the eye. Three lines of investigation have been taken and carried out, in each case on rabbits:—(1) *Absorption.*—Using an iron arc as the source of light and a quartz spectrograph, the absorption of the media of the eye was found to be as follows:—Cornea.—All rays of wave-lengths less than 295 $\mu\mu$ are cut off completely. Lens.—Absorption commences at 400 $\mu\mu$ and is complete beyond 350 $\mu\mu$. Vitreous.—Shows a broad absorption band with ill-defined margins extending from 280–250 $\mu\mu$. All the media were found to be uniformly permeable to rays between the wave-lengths 660–400 $\mu\mu$. (2) Results of repeated exposure of eye to light containing a high proportion of ultra-violet rays. A series of animals were exposed at repeated intervals for from three to twelve months. They showed marked inflammatory reaction in the cornea and conjunctiva, and in one case a proliferation of the cells of the anterior lens capsule. (3) Transmission of hæmolysins to aqueous humour after exposure of eye to short wave-length rays. The aqueous of animals which have been sensitised to the blood of another species has no power of hæmolysing red blood-corpuscles of that species. After exposure of the eye of such an animal to the quartz mercury vapour lamp, the aqueous becomes actively hæmolytic, and remains so for a period not as yet determined, but in any event longer than the duration of the resulting inflammatory changes.—Dr. W. S. **Lazarus-Barlow**: The presence of radium in some carcinomatous tumours. Elsewhere the author published evidence that acceleration of electroscopic leak may be produced by the residue of carcinomatous tissue after its extraction with ether and subsequently with water, or after extraction with acetone. The results were criticised as being small, and as possibly explicable by alteration in capacity of the electroscope occasioned by introduction of the substances within it. The subject was therefore reinvestigated with an electroscope of constant capacity in which a fixed wire grating separated the portion containing the gold-leaf from the portion into which the substances were introduced. Twenty-seven samples of primary carcinoma, eight of secondary carcinoma, two sarcomata, and five normal livers and lungs were examined under these conditions, and the original conclusion was confirmed.—C. **Russ**: An improved method for opsonic index estimations involving the separation of red and white human blood corpuscles. The observed errors by the improved method were one quarter the magnitude of those by the old process, the conditions of experiment being almost completely comparable.—Prof. W. M. **Thornton**: The electrical conductivity of bacteria, and the rate of inhibition of bacteria by electric currents. Tap water containing *B. coli communis* can be completely sterilised by direct currents in several hours at 0·2 ampere sq. cm. Alternating currents sterilise water nearly, if not quite, as well as direct currents having the same current-density. Milk is curdled by direct current at the positive pole and thinned at the negative pole. Milk can be sterilised without curdling by passing alternating current, this being largely thermal. The cause of the marked bactericidal action of light is suggested to be syntony between it and the frequency of electronic rotation in the atoms of protoplasm.—E. C. **Hort** and W. J. **Penfold**: A clinical study of experimental fever. *Conclusions:* (1) That the establishment as separate entities of these various types of fever no longer rests on secure ground; (2) that future advance in the experimental study of fever is not possible unless precaution be taken to ensure that the water or saline used for injection is free from the fever-producing body described.—S. G. **Shattock** and L. S. **Dudgeon**: Certain results of drying non-sporing bacteria in a charcoal liquid

air vacuum. The bacteria used comprised *B. coli*, *B. typhosus*, *Staphylococcus pyogenes aureus*, *B. pyocyaneus*. The action of light was excluded during the experiments. *B. typhosus* and *B. coli* died both *in vacuo* and in air-dried slips within five days. *S. pyogenes aureus* persists considerably longer under both conditions. The interest centres around *B. pyocyaneus*. Air-dried films did not survive beyond nine days. The slips kept *in vacuo* were alive at seven months. *B. pyocyaneus* was submitted *in vacuo* to the action of heat, and also to the sun's rays (the sealed vacuum tubes being submerged in water). Its resistance to these agencies, in the dried state, *in vacuo*, was not materially, if at all, increased. The bacillus was killed, moreover, by the action of ultra-violet rays on being removed from the vacuum and treated in an atmosphere of nitrogen. So far as the possibility of interplanetary bacterial life is concerned, it is evident that bacteria in the fully dried state, if free in the interplanetary vacuum, would be killed by the solar light. As Sir James Dewar's experiments have demonstrated that the ultra-violet rays will kill undried bacteria whilst in the frozen condition at the temperature of liquid air, there is little to support the hypothesis that the living protoplasm on the earth originally immigrated from interplanetary space in a free or unincluded condition—that free, particulate life has entered the earth's atmosphere, as a result of light propulsion, from extramundane space.

Zoological Society, February 20.—Dr. A. Smith Woodward, F.R.S., vice-president, in the chair.—Dr. A. T. **Masterman**: Recent investigations on age-determination in the scales of salmonoids, with special reference to Wye salmon.—Dr. H. Lyster **Jameson**: The structure of the shell and pearls of the Ceylon pearl-oyster (*Margaritifera vulgaris*, Schum.); with an examination of the cestode theory of pearl production. The author began by reviewing the work on the subject of pearl production carried out in Ceylon by Prof. Herdman, F.R.S., and his successors. He examined the theory, enunciated by Prof. Herdman, that most Ceylon "fine" pearls had for their nuclei the remains of cestode larvæ, and that these larvæ, which are abundant in the liver and connective tissues of the pearl-oyster in Ceylon, were the "cause" of the most valuable pearls. Dr. Jameson maintained that the evidence adduced in support of this theory by Prof. Herdman and Mr. Hornell was insufficient. The second part of the paper dealt with the structure and formation of the shell and of pearls. The various repair-substances, which replace the ordinary shell substances under abnormal or pathological conditions, were described, their relations to the normal substances of the shell were discussed, and their occurrence in the pseudo-nuclei of pearls dealt with. The "calcospherules" which Herdman regarded as free concretions, and as the cause of "muscle pearls," were considered to be in fact minute pearls, composed of the hypostracum, or special shell-substance to which the muscles are attached. The author maintained that, as he had already laid down in his 1902 paper, the real cause of pearl production would have to be sought, not in the nuclei or pseudo-nuclei of pearls, but rather in the pathological conditions under which the tissues of the mollusc gave rise to the pearl-sac.—R. **Shelford**: Mimicry amongst the Blattidæ; with a revision of the genus Prosoplecta, Sauss. The author dealt with a number of exceptions to this usually cryptically coloured type of cockroach, and in greater detail with the Prosoplecta, nearly all the members of which presented a remarkably close and detailed resemblance to other insects.—Rev. O. **Pickard-Cambridge**: A contribution to the knowledge of the spiders and other arachnids of Switzerland. The paper was based on a number of specimens collected for the author by various persons, at different times, and contained the description of one new species.

March 5.—Sir J. Rose Bradford, F.R.S., vice-president, in the chair.—H. L. **Hawkins**: The classification, morphology, and evolution of the Echinoidea Holectypoida.—H. G. **Plimmer**: The blood-parasites found in the Zoological Gardens during the four years 1908–11. The paper contained the results of examination of the blood of 6430 animals, in about 7 per cent. of which parasites were found. Many of these parasites were described for the first time, and in other cases the hosts were newly recorded.—Prof. G. O. **Sars**: Zoological results of the third Tanganyika expedition, conducted by Dr. W. A. Cunnington, 1904–6. Report on some larval and young stages of prawns from Lake Tanganyika.—Dr. R. **Broom**: The structure of the internal ear, and the relation of the basi-cranial nerves in Dicynodon, and on the homology of the mammalian auditory ossicles.

Royal Microscopical Society, February 21.—Mr. H. G. Plimmer, F.R.S., president, in the chair.—Mr. **Rousselet**: Fourth list of new Rotifera since 1889. The year 1889 was when Hudson and Gosse's monograph of the Rotifera was completed by the issue of the supplement, recording altogether 400 species at that time. The author explained that his three preceding lists, published in 1893, 1897, and 1902, contained 393 new species, and the fourth list now submitted 214 names, a total of 607 new species since 1889. Mr. Rousselet estimated the present Rotiferous population of the world comprised 857 species. The greatest number of new species in the present list appeared amongst the Bdelloid Rotifers; 101 species, mostly described by James Murray, were obtained from moss collected by him from all parts of the world, from Scotland to the Antarctic regions. Of the other orders represented there were Rhizota, 8; Ploima-Illoricata, 30; Ploima-Loricata, 74; and Scirtopoda, two new species.

Linnean Society, March 7.—Dr. D. H. Scott, F.R.S., president, in the chair.—Prof. Percy **Groom**: Note on the internodes of Calamites. The author contended that the nodes corresponded to a cycle of growth during the vegetative season, and supported his views by measurements supplied by Dr. F. J. Lewis.—Rev. T. R. R. **Stebbing**: Historic doubts about Vaunthompsonia. The author pointed out that the number of the *Natural History Review* for July, 1858, was received by the British Museum at the date stamped as "16 JY 58," thereby proving its priority over Vaunthompsonia.

Mathematical Society, March 14.—Mr. J. E. Campbell, vice-president, in the chair.—G. T. **Bennett**: The cubic surface as a degenerate quartic.—E. B. **Elliott**: Differential operators which generate all seminvariants and all ternary covariant sources.—W. H. **Young**: Goursat's form of Cauchy's theorem (informal).

Mineralogical Society, March 12.—Prof. W. J. Lewis, F.R.S., president, in the chair.—Dr. G. F. Herbert **Smith** and F. N. A. **Fleischmann**: The zeolites from Killyflugh and White Head, Co. Antrim. Chabazite occurs in three different kinds of crystals and gmelinite in two, and the former is found pseudomorphous after calcite. Analcite occurs in clear trapezohedra, and natrolite in fine needles. The character of the occurrences was described.—Dr. J. **Drugman**: Quartz twins. Further specimens of bipyramids, twinned on the primary rhombohedron, from the Esterel, France, were shown, thus establishing this mode of twinning, which was first described by Q.

Sella in 1858. From the same locality were shown also bipyramids twinned on $\xi(11\bar{2}2)$, in which, too, the prism is absent, and there is no flattening perpendicular to the twinning plane, as in the Dauphiné and Japanese specimens.—T. V. **Barker**: Note on the optical properties of mercuric iodide. Preliminary determinations by means of two 30° prisms gave 2·746 and 2·447 as the values of the ordinary and extraordinary refractive indices for sodium, and 2·566 and 2·357 for lithium light, respectively, the degree of accuracy being about 0·002. More accurate values are anticipated when better prisms have been prepared, but the results so far obtained suffice to show that the double refraction and colour dispersion are remarkably large in amount.—Arthur **Russell**: Notes on the minerals and mineral-localities of Shropshire. The occurrences of thirty-two species, excluding rock-forming minerals, were described. Calcite was obtained at Snailbeach Mine, Minsterley, in splendid crystals of varied habit, among others being large, pale mauve rhombohedra twinned on $c(111)$, and opaque, white, prismatic crystals twinned on $r(100)$. Very large crystals of barytes and fine crystals of calcite came from Wotherton Mine, Chirbury. The occurrence of pyromorphite and witherite at several localities was noted.—Dr. Emil **Hatschek**: A series of specimens and lantern-slides illustrative of some reactions in gels. An inorganic gel (silicic acid) was used, and the compounds resulting from the diffusion in it of several solutions were shown; there was a tendency to banding in the upper part of the precipitate, while spherulitic growths appeared in nearly every case.—W. Campbell **Smith**: A spherulitic dolerite from Vryheid, Natal. The rock was interesting on account of the size and beauty of the spherulites, which are revealed on the weathered surfaces.

Royal Anthropological Institute, March 19.—Mr. Alfred P. Maudslay, president, in the chair.—Dr. C. S. **Myers**: Primitive music. The chief objects and methods of studying the music of primitive peoples were described, illustrated by examples from Borneo (Sarawak), Torres Straits (Murray Islanders), and Ceylon (Veddas). The music of the Murray Islanders and of the Todas was analysed to show (1) the wide difference even between such very simple forms of music belonging to two distant peoples; (2) the different lines of musical development traceable within different communities; (3) the great importance, alike for ethnology and for musical history, of studying the process of diffusion of the various styles of music and also of musical instruments, in regard to their form, their intervals, and their absolute pitch.

EDINBURGH.

Royal Society, February 19.—Prof. Ewart, F.R.S., vice-president, in the chair.—Dr. Thomas **Scott**: The Entomostraca of the Scottish National Antarctic Expedition. The collection consisted chiefly of Copepoda, of which there were 145 species, three parasitic, the rest free-living. Sixty-two species, including one new variety, belonged to the suborder Calanoida. The Harpacticoida were represented by forty-one species, twenty-eight being new, with two new genera, almost all taken in or near Scotia Bay, South Orkneys. There were twenty-seven species (three new and one new variety) of Cyclopoida, and one species of Caligoida. The Cladocera in the collection were represented by two species of Evadne. There were twenty-two species of Ostracoda, of which fourteen (ten new) were collected in Scotia Bay.—Dr. W. E. **Hoyle**: The Cephalopoda of the Scottish National Antarctic Expedition. Six species were taken off South Africa, four (one new) off South America, and four were Antarctic, being obtained near Scotia Bay. The new species of Polypus, *P. Brucei*, was represented by a single male specimen from the Burdwood Bank, off Tierra del Fuego. Male and female specimens of *Moschites charcoti*, examples of which have been only once previously recorded, were taken in Scotia Bay.—Prof. W. A. **Herdman**: The Tunicata of the Scottish National Antarctic Expedition. The collection was a large one, characterised by the abundance and large size of individuals, by the excellent preservation of the specimens, and by morphological variations. Of the Ascidiaceæ (simple and compound), there were sixteen different species (one new) in six families of six genera, mostly obtained from the Falkland and South Orkney Islands. The new species, *Fungulus antarcticus*, was a deep-sea form obtained in lat. 64° S. at a depth of 2485 fathoms. The rare genus Fungulus is represented by only another solitary specimen, *F. cinereus*, Herdman, got by the *Challenger* at 1600 fathoms' depth in lat. 46° S. between the Cape of Good Hope and Kerguelen Island, at least 3000 miles distant from where the new species was found.—Prof. Andrew **Gray**: General dynamics. Note I.: Hamilton's partial differential equations and the determination of their complete integrals. The partial differential equations were deduced directly from the canonical equations, and important use was made of the second partial differential equation which is satisfied by the function S′, a function which has been comparatively little used. Some interesting relations between the functions S and S′ were established, and were utilised in applications.—Prof. Sutherland **Simpson**: An investigation into the effects of seasonal changes on body temperature. The experiments were made with 114 domestic fowls, six different breeds being represented. In a general way the body temperature followed that of the external air, being lowest in the winter months and highest in the summer months. The barometric pressure had no influence. The curve of egg-production reached its highest level in April and May; and in general it was found that cyclical body changes had little or no effect on body temperature as compared with outside influences.

MANCHESTER.

Literary and Philosophical Society, February 20.—Prof. F. E. Weiss, president, in the chair.—Prof. W. H. **Lang**, F.R.S.: Branching in the Ophioglossaceæ. The branching in Helminthostachys was shown to be related to the vestigial buds discovered by Gwynne-Vaughan. The vascular supply to the branch was connected with the stele of the rhizome, and not with the subtending leaf-trace. Vestigial buds are also constantly present in the axils of the leaves of *Botrychium lunaria*, and may have a vestigial vascular supply derived from the margins of the subtending leaf-trace. When a branch develops, its vascular supply is from the leaf-trace, and not from the stele of the stem. The branches that occur occasionally in Helminthostachys and Botrychium are not "adventitious," but originate from these dormant axillary buds. They are comparable with the branches of the Hymenophyllaceæ and Zygopteridæ, and their structure strengthens the probability of a relationship between the Ophioglossaceæ and the latter group.—T. G. B. **Osborn**: Recent investigations into the nature of the moulds which attack exported cotton goods. Several common fungi and bacteria were found infecting the goods.

March 5.—Prof. F. E. Weiss, president, in the chair.—R. L. **Taylor** and Clifford **Bostock**: The action of dilute acids on bleaching powder. In these in-

vestigations a method originally described by Taylor was used for distinguishing between free chlorine and hypochlorous acid, and, in a mixture of the two, determining their relative amounts. Bleaching powder was distilled with varying amounts of different acids, together with a considerable amount of water. Hydrochloric, sulphuric, and nitric acids act pretty much alike, giving off, with comparatively small amounts of acid, almost pure hypochlorous acid, but, with larger amounts of acid, mixtures of hypochlorous acid and chlorine, and finally nothing but chlorine. Acetic and phosphoric acids act in the same way with small amounts of acid, but the hypochlorous acid never entirely disappears, even with large quantities of acid. When bleaching powder is distilled with boric acid (and a sufficient amount of water), practically pure hypochlorous acid is produced, even when the boric acid is used in comparatively large quantities. Although at the ordinary temperature carbon dioxide liberates nothing but chlorine from bleaching powder, as the temperature is raised hypochlorous acid begins to be evolved, mixed with chlorine, and when the liquid is actively boiling practically pure hypochlorous acid is produced.—Dr. A. **Holt**, Dr. **Edgar**, and Mr. **Firth**: Sorption of hydrogen by pallidium. Experiments lead to the following conclusions:—(1) Pallidium is not always in a condition in which it will absorb hydrogen, but it can be made to do so by heating to about 400° C. in either air or *in vacuo*. The power of picking up gas dies away with time, and cannot be restored unless the metal is reheated. (2) Hydrogen is first condensed on the surface of the metal (*ad*sorbed layer), and then gradually diffuses inwards (*ab*sorption). It is possible to get the metal either saturated outside and with no gas in the interior, or saturated in the interior and not on the surface. (3) Diffusion of hydrogen through the metal begins at about 120° C., and increases in rate with rise of temperature. The same temperature does not, however, always produce the same rate, as it depends somewhat on the state of the metal. The rate does not obey any simple law of diffusion or effusion.

PARIS.

Academy of Sciences, March 4.—M. Lippmann in the chair.—A. **Lacroix**: The granular rocks intrusive in the basaltic breccias of Reunion. Their importance in the interpretation of the origin of the homogeneous enclosures of the volcanic rocks. The author has been led by a study of the *massif* of the Piton des Neigès at Reunion to modify his views on the formation of the enclosures, and considers that they must be regarded as having been formed in the volcano itself and not consolidated at great depths.—MM. **Leclainche** and **Vallée**: The specific treatment of wounds. Details of the preparation of a polyvalent serum for the treatment of wounds, and a preliminary account of the results obtained by its use.—Emile **Belot**: The formation of the lunar craters with experimental reproduction.—Frédéric **Riesz**: Some points in the theory of summable functions.—MM. **Papin** and **Rouilly**: The gyropter. A description of a helix for use in aërostats, driven by reaction and having no mechanical connection with the motor.—A. **Grumbach**: The detection of very small quantities of material by the direct electrometric method.—Pierre **Achalme**: The function of interatomic electrons in electrolysis.—Georges **Baume** and Néoptolème **Georgitses**: The fusibility curves of some volatile binary systems at very low temperatures. The binary systems investigated were hydrogen chloride-hydrogen sulphide, hydrogen chloride-ethane, and hydrogen chloride-propionic acid. The melting points of these mixtures were studied down to −170° C., and the results given as curves.—A. **Faucon**: The rotatory power of camphor dissolved in carbon tetrachloride as a function of the concentration. An expression has been deduced from the experiments giving the rotatory power of solutions of camphor in carbon tetrachloride. The influence of temperature on the rotation has also been studied.—A. **Recoura**: The complex ferric compounds. Ferric fluoride.—A. **Magnan**: The weight of the stomach in mammals.—Mieczyslaw **Oxner**: Experiments on memory and its duration in marine fishes. The experiments were carried out with freshly caught specimens of *Coris julis* and *Serranus scriba*; these fishes were able to remember colour, and the memory lasted not less than twenty-five days.—O. **Dubosq** and Ch. **Lebailly**: The spirochæta of fishes.—M. **Sollaud**: The metamorphoses of *Leander serratus*.—Raphael **Dubois**: Clasmatosis of the shell and pearl: its function in the formation of the mollusc shell and of pearls. The formation of pearls cannot be traced to a single cause, and the author concludes that the mechanism of the formation of the shell and the pearl is the same. The mechanism consists fundamentally in the formation of two secretions. It results from these researches that there are two modes of pearl formation, one parasitic and the other non-parasitic.—Michel **Cohendy**: Experiments on life with pure cultures following on aseptic life. In a previous paper the author has described the growth of fowls raised under absolutely aseptic conditions. In some cases the bird was accidentally contaminated with micro-organisms, and these cases have been kept under observation in order to see how they affected the development. The result showed that the sterile chicken is not abnormally sensitive to microbial action. It would appear, however, that a bacterium innocuous to the non-aseptic bird may become pathogenic to the aseptic bird.—Alfred **Carpentier**: The discovery of a Psaronius with a well-preserved structure in the lower Westphalian in the north of France.—P. E. **Dubaleu**: The warm springs of the department of the Landes.

BOOKS RECEIVED.

Uber die Luftsäcke der Vogel. By F. E. Schulze. Pp. 36+plate. (Jena: G. Fischer.) 1.60 marks.

Experimentelle Studien zur Soma- und Geschlechtsdifferenzieurung. By Prof. J. Meisenheimer. Pp. 28. (Jena: G. Fischer.) 1 mark.

Handwörterbuch der Naturwissenschaften. Edited by E. Korschelt and others. Zweite und Dritte Lieferung. Pp. each 160. (Jena: G. Fischer.) 2.50 marks each.

Johnston's Handbook to the Celestial Globe. Pp. 32. (Edinburgh and London: W. and A. K. Johnston, Ltd.) 1s.

Über die Helligkeit des Himmels in der Nahe der Sonne. By H. Diercks. Pp. 48. (Kiel: Lüdtke & Martens.)

Propriétés Optiques des Muscles. By Dr. F. Vlès. Pp. xvii+372. (Paris: A. Hermann & Fils.) 15 francs.

Forme, Puissance et Stabilité des Poissons. By Prof. F. Houssay. Pp. 372. (Paris: A. Hermann & Fils.) 12.50 francs.

Proceedings of the London Mathematical Society. Second series. Vol. x. Pp. vi+486. (London: F. Hodgson.)

Uber die Gesetze der Wärmestrahlung. By W. Wien. Pp. 21. (Leipzig: J. A. Barth.) 1 mark.

The Measurement of High Temperatures. By G. K. Burgess and H. Le Chatelier. Third edition. Pp. xviii+510. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd.) 17*s.* net.

The Fauna of British India, including Ceylon and Burma. Coleoptera. General Introduction and Cicindelidæ and Paussidæ. By Dr. W. W. Fowler. Pp. xx+529. (London: Taylor and Francis.) 20*s.*

Microbes and Toxins. By Dr. E. Burnet. Translated by Drs. C. Broquet and W. M. Scott. Pp. xvi+316. (London: W. Heinemann.) 5*s.* net.

Bacteria as Friends and Foes of the Dairy Farmer. By W. Sadler. Pp. xv+112. (London: Methuen and Co., Ltd.) 1*s.* 6*d.*

Gem-stones and their Distinctive Characters. By Dr. G. F. H. Smith. Pp. xiv+312. (London: Methuen and Co., Ltd.) 6*s.* net.

Reptiles, Amphibia, Fishes, and Lower Chordata. By R. Lydekker and others. Pp. xvi + 510. (London: Methuen and Co., Ltd.) 10*s.* 6*d.* net.

Principia Mathematica. By Dr. A. N. Whitehead and B. Russell. Vol. ii. Pp. xxxiv+772. (Cambridge: University Press.) 30*s.* net.

Reinforced Concrete Design. By O. Faber and P. G. Bowie. Pp. xix+332. (London: E. Arnold.) 12*s.* 6*d.* net.

Elementary Plant Biology. By J. E. Peabody and A. E. Hunt. Pp. xiii+207. (London: Macmillan and Co., Ltd.) 4*s.*

Outlines of Evolutionary Biology. By Prof. A. Dendy. Pp. xiv+454. (London: Constable and Co., Ltd.) 12*s.* 6*d.* net.

DIARY OF SOCIETIES.

THURSDAY, MARCH 21.

ROYAL SOCIETY, at 4.30.—On the Self-induction of Electric Current in a thin Anchor-ring: Lord Rayleigh, O.M., F.R.S.—The After luminosity of Electric Discharge in Hydrogen Observed by Hertz: Hon. R. J. Strutt, F.R.S.—On the Changes in the Dimensions of a Steel Wire when Twisted, and on the Pressure of Distortional Waves in Steel: Prof. J. H. Poynting, F.R.S.—The Critical Constants and Orthobaric Densities of Xenon: H. S. Patterson, R. S. Crinps, and R. Whytlaw-Gray.—Experimental Work on a New Standard of Light: W. A. Harwood and J. E. Petavel, F.R.S.—On the Distribution of the Scattered Röntgen Radiation: J. A. Crowther.—The Passage of Homogeneous Röntgen Rays through Gases: E. A. Owen.—Fluorescent Röntgen Radiation from Elements of High Atomic Weight: J. C. Chapman.—The Nature of the γ Rays excited by β Rays: J. A. Gray.

ROYAL INSTITUTION, at 3.—Seasonal Dimorphism in Butterflies: Dr. F. A. Dixey, F.R.S.

INSTITUTION OF MINING AND METALLURGY, at 8.—Annual Meeting.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—*Discussion*: The Causes Preventing the More General Use of Electricity for Domestic Purposes: Opener, S. Z. de Ferranti, President.

LINNEAN SOCIETY, at 8.—The Orthoptera-Phasmidæ of the Seychelles: Dr. Ignacio Polivar and Charles Ferrière.—Living Specimens of Phasmidæ: Prof. A. Dendy, F.R.S.—Phyllody of carpels in *Trifolium repens*: Miss May Rathbone.—*Nitocrameira bdellurae*, a New Genus of Parasitic Canthocamptidæ: J. A. Liddell.—Periodicity of the Phytoplankton of some British Lakes: W. West and Prof. G. S. West.—Plants from South Portugal: H. N. Dixon.

FRIDAY, MARCH 22.

ROYAL INSTITUTION, at 9.—The North Sea and Its Fisheries: Prof. D'Arcy W. Thompson, C.B.

PHYSICAL SOCIETY, at 5.

SATURDAY, MARCH 23.

ROYAL INSTITUTION, at 3.—Molecular Physics: Sir J. J. Thomson, O.M., F.R.S.

MONDAY, MARCH 25.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration in N.W. Mongolia and Dzungaria: Douglas Carruthers.

ROYAL SOCIETY OF ARTS, at 8.—Materials and Methods of Decorative Painting: Noel Heaton.

INSTITUTE OF ACTUARIES, at 5.—Notes on the Construction of Mortality Tables: W. Palin Elderton and R. C. Fippard.

TUESDAY, MARCH 26.

ROYAL SOCIETY OF ARTS, at 4.30.—British North Borneo: Leonard Lovegrove.

ROYAL INSTITUTION, at 3.—Ancient Britain: Dr. T. Rice Holmes.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Further Discussion*: The Main Drainage of Glasgow: A. B. McDonald and G. M. Taylor.—The Construction of the Glasgow Main Drainage Works: W. C. Easton.—Glasgow Main Drainage: The Mechanical Equipment of the Western Works and of the Kinning Park Pumping Station: D. H. Morton.—*Probable Paper*: The Works for the Supply of Water to the City of Birmingham from Mid-Wales: E. L. Mansergh and W. L. Mansergh.

FARADAY SOCIETY, at 8.—Dry Batteries: the Relation between the Incidence of the Discharge and the Relative Capacity of Cells of Different Manufacture: S. W. Melsom.—Contributions to the Knowledge of Liquid Mixtures. I. and II.: Dr. R. B. Denison.—Electrolysis in Liquefied Sulphur Dioxide: L. S. Bagster and Dr. B. D. Steele.—The Elimination of Potential due to Liquid Contact. II.: Dr. A. C. Cumming.—Vapour-pressure of Concentrated Aqueous Solutions: Dr. E. P. Perman and T. W. Price.

WEDNESDAY, MARCH 27.

ROYAL SOCIETY OF ARTS, at 8.—The Whaling Industry of To-day: Theodore E. Salvesen.

GEOLOGICAL SOCIETY, at 8.—The Glaciation of the Black Combe District (Cumberland): Bernard Smith.—The Older Palæozoic Succession of the Duddon Estuary: J. F. N. Green.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

THURSDAY, MARCH 28.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: A Confusion Test for Colour Blindness: Dr. G. J. Burch, F.R.S.—On the Systematic Position of the Spirochaetes: C. Dobell.—The Influence of Selection and Assortative Mating on the Ancestral and Fraternal Correlations of a Mendelian Population: E. C. Snow.—The Human Electrocardiogram; a Preliminary Investigation of Young Male Adults, to form a Basis for Pathological Study: T. Lewis and M. D. D. Gilder.—The Production of Variation in the Physiological Activity of *B. coli* by the Use of Malachite-Green: C. Revis.—(1) Notes on some Flagellate Infections found in certain Hemiptera in Uganda; (2) Notes on certain Aspects of the Development of *T. gambiensi in Glossina palpalis*: Muriel Robertson.—Antelope and their Relation to Trypanosomiasis: Dr. H. L. Duke.

ROYAL INSTITUTION, at 3.—Sexual Dimorphism in Butterflies: F. A. Dixey, F.R.S.

CHEMICAL SOCIETY, at 4.30.—Presidential Address: Some Stereochemical Problems: Prof. Percy F. Frankland, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Power Factor and Conductivity of Di-electrics when tested with Alternating Electric Currents of Telephonic Frequency at Various Temperatures: Dr. J. A. Fleming, F.R.S., and G. B. Dyke.

FRIDAY, MARCH 29.

ROYAL INSTITUTION, at 9.—Results of the Application of Positive Rays to the Study of Chemical Problems: Sir J. J. Thomson, O.M., F.R.S.

SATURDAY, MARCH 30.

ROYAL INSTITUTION, at 3.—Molecular Physics: Sir J. J. Thomson, O.M., F.R.S.

CONTENTS.

	PAGE
An English Physiologist	55
Geology of the Paris Basin. By R. B. N.	56
Wind Charts of the Atmosphere. By R. C.	57
First Aid on the Farm	58
The Nature of Bone. By Prof. G. Elliot Smith, F.R.S.	59
Our Bookshelf	60
Letters to the Editor:—	
Acquired Characters and Stimuli.—Sir E. Ray Lankester, K.C.B., F.R.S.	61
Coordinated Purchase of Periodicals in two Newcastle Libraries.—Basil Anderton	61
Mars and a Lunar Atmosphere.—The Writer of the Note	62
Observed Fall of an Aërolite near St. Albans.—G. E. Bullen	62
The Influence of Weather on Bees. By Herbert Mace	62
The Vivisection Report	65
Notes	65
Our Astronomical Column:—	
Nova Geminorum No. 2. (*With Diagram.*)	70
Observations of Mars	70
The Constitution of the Ring Nebula in Lyra	70
The National Physical Laboratory during 1911	71
Ozone and Ventilation	72
La Houille Blanche	72
Poetry and Science. By Dr. T. Herbert Warren	73
Civil Service Estimates for Science and Education	74
The Gyrostatic Compass and Practical Applications of Gyrostats. By G. K. B. Elphinstone	74
University and Educational Intelligence	75
Societies and Academies	76
Books Received	79
Diary of Societies	80