THURSDAY, OCTOBER 29, 1896.

SCIENTIFIC BIBLIOGRAPHY.

The Theory of National and International Bibliography. (*With Special Reference to the Introduction of System in the Record of Modern Literature.*) By Frank Campbell (of the Library, British Museum). Medium 8vo. Pp. 500. (London: Library Bureau, 1896.)

"WHAT is history," said Napoleon, "but a fiction agreed upon." . . . "The only point on which librarians are united is that classification is a question *disagreed upon.*" So writes Mr. Campbell, and the quotation is an apt illustration of our present position. At a time, therefore, when the cataloguing and indexing of the literature of the mathematical and natural sciences is being so seriously taken in hand, and it is agreed that it shall be carried out by international co-operation, he is doing a considerable service by issuing in a collected form his various published papers on the theory of bibliography together with others not previously printed. Many of the suggestions made by him are undoubtedly of great value; it is a little unfortunate that his views are not presented in a more coherent, collected form, either at the commencement or end of the book, as it is not easy to extract the pith and marrow of his arguments, although it must be gratefully acknowledged that he has adopted the unusual course of trying, by means of darker type, to aid the eye as much as possible to discern the leading points in the several essays—thereby setting an example which it is worth while to carefully take note of.

The charm of the work is that it is characterised by breadth of view and the advocacy of a go-ahead-without-regard-to-obstacles policy, which give it a peculiar interest; indeed, it is delightful to find so much enthusiasm displayed over so dry a subject as the cataloguing of literature. But Mr. Campbell sees clearly the great importance of the problems to be solved, and that they must be dealt with on a corresponding scale, being evidently a determined supporter of the doctrine laid down by an authority so great as Carlyle ("You must front the difficulties, whatever they may be, of making proper catalogues") in the evidence he gave before the British Museum Commission of 1849, which is appropriately printed at the close of the volume. There can be no doubt that it is only by recognising the truth of this contention, *and carrying it into practice*, that scientific workers will be able in the future to fully secure from books the aid they can afford; it was freely admitted at our recent International Conference, and the fact that the meeting was dominated by such a spirit is the most hopeful omen of ultimate success that could possibly be desired.

"We are already half a century behind the times in bibliography, and are not moving fast enough," says Mr. Campbell; and he then asks, "Why this want of progress?" The reasons he gives, among others, are

"because we fail to recognise what an amount of theoretical and practical investigation of the subject is necessary before we can possibly be in a position to commence operations aright; because we continue to delude ourselves that it is possible for private enterprise to carry out that which the State alone can perform; and because we expect that Bibliography will evolve itself without a preliminary expenditure of money. We continue to build libraries and to accumulate books, but we have *not* paid sufficient attention to making books still more accessible for research. Our attention has been too exclusively concentrated on collections in particular libraries, to the neglect of the great annual national collection pouring from the press. Moreover, we have become too contentedly accustomed to the idea of confusion, and have grown to regard it as a natural and necessary evil. But it is high time to rise and shake ourselves free from the trammels of past traditions. We have roads and railways and rivers free of access to all. But the channels of *printed* thought communication are yet horribly blocked. It remains for us to clear them."

To all of which every one interested in the subject will say—Amen!

The book is very largely devoted to the discussion of matters of bibliographical reform. It was intended to issue it in time for the International Conference, and it would undoubtedly have been of interest to us. It is satisfactory that the circular letter issued by the Royal Society in 1894, in order to obtain opinions as to the feasibility of preparing a catalogue of scientific literature by international co-operation, is referred to by Mr. Campbell as remarkable as showing how thoroughly the Committee grasped the essential points of importance from a bibliographer's point of view. As we have been assured by over-anxious critics that we were on an altogether wrong track, such recognition is encouraging; and when the steps taken both during the preliminary stages and at the Conference are considered, it is clear that on the whole our action has been substantially in accord with the views set forth in detail in the work under notice, and will involve ultimately the putting into practice of many of its recommendations.

To readers of NATURE, one of the most important chapters in the book is that dealing with the influence and functions of learned societies in regard to bibliography, in which the much-needed and valuable advice is given that the learned societies should try to define their several jurisdictions more sharply, so as not to overlap, if it can be helped; and that they should pay greater attention to the details of publication. A large mass of literature appears every year—Mr. Campbell says—which, through the neglect of certain necessary principles and details, raises gratuitous obstacles in the path of research, and defies the best efforts of librarians to remedy the evil. . . . Learned societies are among the worst offenders in the matter, he asserts. . . . But in the majority of instances, he thinks, it is rather a matter of ignorance, or oversight. There has not been sufficient scientific study of the subject, and men have not yet realised the full necessity for absolute co-operation between the author, printer, publisher and librarian.

Those of us who have to do with the publication of accounts of scientific work are only too well aware that such is the case. There is no doubt that learned societies allow far too much freedom of individual action, and that while taking objection to technical points—the responsibility for which might well be cast entirely upon authors—allow the gravest literary malpractices to pass unnoticed. Writers in scientific periodicals are too often either inexperienced or careless owing to want of leisure, and consequently offer papers which are ill-arranged and intolerably diffuse, being full of unnecessary detail. I would have all such returned to their authors, although I well know, from sad experience, that nothing gives greater offence. But what a reformation of our scientific literature will follow from the adoption of such a course! We shall then be able to read what is written. Carefully composed and provided with well-chosen titles, our papers will be easy to index; and when memoirs are kept within reasonable compass, library shelves will not be so grievously overburdened with waste-paper as they are under the present want of system.

"The writing out of scientific investigations is usually a troublesome affair; at any rate, it has been so to me. Many parts of my memoirs I have re-written five or six times, and have changed the order about until I was fairly satisfied. But the author has a great advantage in such a careful wording of his work. It compels him to make the severest criticism of each sentence and each conclusion. . . . I have never considered an investigation finished until it was formulated in writing, completely and without any logical deficiencies. Those among my friends who were most conversant with the matter represented to my mind my conscience, as it were. I asked myself whether they would approve of it. They hovered before me as the embodiment of the scientific spirit of an ideal humanity, and furnished me with a standard" (H. v. Helmholtz, Jubilee Address).

May we not say—"Scientific societies, please copy"? No one could take offence if such a quotation were printed at the head of the circular letter requesting an author to revise his manuscript.

To reproduce almost verbally the voluminous notes of a piece of work made from day to day in the laboratory book serves the purpose neither of the writer nor of science, as the results become obscured in a mass of unnecessary detail. And we rarely need to know the process of self-education through which the worker passes. In this matter also we may therefore, as a rule, safely take Helmholtz as our guide, and follow the advice he gives by implication when he says: "In my memoirs I have, of course, not given the reader an account of my wanderings, but I have described the beaten path on which he can now reach the summit without trouble."

Mr. Campbell has much to say on the value of the section in the arrangement of a work which may be commended to scientific writers. All must agree with him that the future of literary study is greatly dependent on special libraries or sections of libraries in which *all* the works on particular subject-groups are to be found; and that, instead of following the principle of first making a muddle and then indexing it, scholars of particular subjects will demand that their material shall be kept separate from other literature. The argument applies equally to individual papers, if these are to be properly indexed in the future; and in principle it is the argument which leads us to insist that carefully classified subject-indexes must be regularly supplied for the use of workers in science.

"One thing is very certain, that people *will* have special bibliographies, whatever we may say, because they supply a legitimate want. We may, therefore, just as well seriously take the matter in hand and see that it is done properly once and for ever, instead of allowing it to be done badly. And on this head be it remembered that the curse of bad work does not always end with itself, but often not only delays but actually prohibits the work from ever being properly carried out."

Sounder advice could not possibly be given, and it is refreshing to find the opinion expressed by Mr. Campbell that it is a fallacy to suppose that bibliographers can never agree together on any one system of classification; one of the most deadly arguments brought against the idea of special bibliographies, it is one, he says, which he trusts we shall soon trample under foot. And it is important to note that he is not considering books alone: any article on a subject is defined by him as a work to be catalogued and indexed.

Mr. Campbell regards State aid as essential in the preparation of national bibliographies, and his proposals on this head are worthy of the most serious attention; it is more than probable, now that the work of organisation is being put in hand, that effective steps may soon be taken to secure the registration of State publications for which he pleads. One of the most important resolutions adopted at the International Conference had reference to the organisation of national offices in connection with the international central office.

Once set rolling, the ball cannot possibly be brought to rest. The appearance of so many distinguished and representative delegates at the meeting at the Royal Society's rooms—and the complete unanimity which prevailed on all essential questions—was evidence of the general willingness to recognise the importance of the scheme; the vote taken at the outset was a formal ratification of its purpose, and will serve to pledge the various Governments concerned to do their utmost to facilitate the execution of the enterprise. There can be little doubt that scientific bodies generally must now regard it as their duty to promote such a work: those who do not will be guilty of shameful desertion in the face of the enemy, for never was such an opportunity given before.

But the Conference clearly recognised that the individual worker must also take an important share in the work, as in preparing the subject-matter index regard is to be had not only to the title of a paper or book, but also to the nature of the contents. It will be necessary therefore, in the future, that all publishing bodies insist that authors supply subject-indexes with their papers, as the work of reading papers with this object in view cannot possibly be carried out at any central office. The preparation of such subject-indexes will, however, need the greatest care, in order that whilst all points are indicated to which the attention of workers should be drawn, at the same time the entries are, as far as possible, limited in number.

It is to be hoped that serious attention will now be given to the question of indexing, and that the requirements to be met will be fully realised. As Mr. Campbell very properly insists, a large amount of theoretical and practical investigation of the subject is necessary before we can possibly be in a position to commence operations aright and develop a scientific bibliography of the literature of science. How to classify the subject-matter in the various main and sub-branches of science is the great question before us, which needs an immediate answer, and to which we must therefore most earnestly devote our attention. HENRY E. ARMSTRONG.

PALÆONTOLOGY AND EVOLUTION.

Essai de Paléontologie Philosophique: Ouvrage faisant suite aux Enchaînements du Monde Animal dans les Temps Géologiques. By Prof. Albert Gaudry. Pp. 230. (Paris: Masson et Cie, 1896.)

THE present volume forms a supplement to Prof. Gaudry's well-known series of semi-popular treatises on Palæontology, entitled "Enchaînements du Monde Animal dans les Temps Géologiques." In it the author has summed up most of the evidence brought forward in his previous volumes, and attempts to deduce from it a general outline of the course of the evolution of the animal kingdom from the dawn of life to the present day. Like so many French scientific writers, Prof. Gaudry possesses in an eminent degree the power of presenting the facts of his science to the general reader in a lucid and attractive manner: in this respect the book leaves nothing to be desired. If however, its arguments be examined, there is less cause for satisfaction, many of them being illogical, and giving evidence of strong bias on the part of the author. Moreover, the neglect of much of the recent literature of the subjects discussed is greatly to be regretted.

The dominant idea of the book is, that there is a general parallelism between the evolution of animals in the course of geological time and the development of an individual man in the course of his life, there being in both cases a gradual increase in the number of the constituent elements, and in the degree of their differentiation, as well as in bulk, activity, and intelligence. That such an analogy is to some extent traceable, probably no one will be disposed to deny, but the writer attempts to push it too far.

Thus two plates of restored figures of various living and extinct animals, drawn to scale, are given for the purpose of demonstrating that there has been a gradual increase in bulk from the first. Now it may be quite true that some of the whales are the largest animals that have ever existed; but if we examine any of the great groups, other than the mammals, which are of comparatively recent origin, it becomes clear that no such progressive increase in bulk has taken place. In most cases there has been an increase up to a certain point; but this has been followed by a diminution. For example, the Amphibia attained their maximum size in the Triassic, the Reptilia in the Jurassic periods. Even the Mammalia seem to be already on the decline in point of size, the Pleistocene species having, in most cases, been larger than their modern representatives. The whales, owing to the peculiar conditions of their existence, are exceptional, but they also are probably doomed to extinction at no very remote date.

As to the causes of evolution, Prof. Gaudry dismisses Lamarck and Darwin in two lines, with the remark that the question is at present too obscure for discussion. He then proceeds to discuss it at considerable length, and arrives at results so remarkably simple, that the reason for his unceremonious treatment of other writers becomes apparent. In short, Prof. Gaudry considers that organic evolution is directed from the outside by a conscious agent, and that while sublunary causes may be held accountable for the loss or reduction of any existing organ, the appearance of any new structure is attributable to the direct interposition of this guiding power. That such views should find expression in a work by so eminent a writer, and particularly in one intended for the general reader, is much to be regretted, since they are certain to lead to much misconception as to the present position of the doctrine of evolution; while they will be triumphantly quoted as authoritative by those with whose preconceived ideas they seem to harmonise.

The book is well printed and illustrated, and is a storehouse of interesting facts, but is not to be recommended to those who do not possess the necessary knowledge to separate the wheat from the tares.

GATTERMANN'S PRACTICAL ORGANIC CHEMISTRY.

Practical Methods of Organic Chemistry. By Ludwig Gattermann, Ph.D. Translated by William B. Shober, Ph.D. Pp. 329, with 82 Figures. (London: Macmillan and Co., Ltd., 1896.)

FOR some time past the student of organic chemistry has been amply provided with text-books and manuals dealing with the theory and facts of the science, but even now his choice is very limited when he comes to select a book which will help him to overcome difficulties in the laboratory.

For this reason alone the appearance of Prof. Gattermann's work in German was warmly welcomed in this country, not only by students, but also by those who have to direct practical work in organic chemistry; and the translation, which has now been made by Dr. Shober, and which "is intended for those students of chemistry who have not yet become sufficiently familiar with scientific German to be able to read it accurately without constant reference to a dictionary," will no doubt make the work accessible to an even larger number of readers.

The book is divided into three parts, the first of which deals with crystallisation, distillation, and other methods of purification, and also with the analytical methods employed in the case of organic compounds. In this part the author describes in great detail most of the operations which have to be constantly performed in preparation- and in research-work, and also the apparatus which is generally employed.

It is evident that the greatest care has been taken to make this description so complete that it would be hardly possible, even for a beginner, to make mistakes in his later work, if he had thoroughly mastered this introductory, but very important, part. In adopting such a plan a certain amount of repetition is perhaps unavoidable, and in some cases instructions which have been given only a page or two previously, are repeated almost word for word. It is no doubt with the same object, namely, of preventing accidents and mistakes, that the author has in a few instances given directions which appear to be quite unnecessary, and which seem to imply that the student is devoid of common sense.

The description of the ordinary analytical methods, which closes Part i., is so minute in every particular that an ordinary combustion, for example, should be carried out successfully by a beginner without further assistance; some portions here might, perhaps, be abridged with advantage, especially those dealing with the estimation of halogen and of sulphur, but merely in order that space might be found for a description of the analysis of organic salts, &c., and of the methods used in the determination of vapour density and molecular weight; such an alteration would make this general part even more useful as an introduction to research-work.

In Part ii. the author gives instructions for the preparation of a large number of compounds, the examples being carefully chosen in order to illustrate practically all the more important reactions, including those only recently discovered. After each preparation there follows a brief account of the theory of the reaction which has been studied, other practical methods by which similar results may be attained are pointed out, and, with the aid of numerous examples, the general application of the reaction is considered; the properties of the preparation, and of the class of substances to which it belongs, are also described, the more important reactions being illustrated by test-tube experiments which the student is directed to perform. The classification of the preparations into "alipathic" and "aromatic," which is here adopted, and the treatment of the former before the latter, are no doubt necessary from an author's point of view; but if this course is strictly adhered to in practice, it has the disadvantage that the student undertakes some of the more difficult preparations before he has had any experience. Prof. Gattermann does not indicate whether the preparations are intended to be carried out in the given order; but as each is practically complete in itself, there is no reason why a little discretion should not be exercised, the easier ones being taken first.

This part of the book is an elegant combination of practice and theory, and cannot fail to arouse and maintain interest in both; it will doubtless have the result which the author desires, namely, "that the student already, during the period given to aboratory work, becomes familiar with the most varied theoretical knowledge possible, which, acquired under these conditions, adheres more firmly, as is well known, than if that knowledge were obtained exclusively from a purely theoretical book."[1]

In Part iii., which consists of a few pages only, the author gives details of the preparation of some inorganic compounds (the halogen acids, phosphorus chlorides, &c.) which are very frequently used in organic work.

It would be hard, indeed, to express anything but a very favourable opinion of Prof. Gattermann's excellent book as an introduction to practical organic chemistry; a student who reads it carefully will save himself labour, time, and material, and will avoid many of the usual mistakes and accidents; at the same time, he will gain a sound practical knowledge which will help him to commence research with a good prospect of success.

Dr. Shober's translation is very readable, although it bears traces of the impress "Made in Germany": the nomenclature might, perhaps, have been brought more in accordance with that adopted by the Chemical Society, but inasmuch as almost every chemist has his own system, it is impossible to please all.

Since the advance of organic chemistry in this country must, in some measure, depend on the nature of the available text-books, both the author and translator deserve our thanks for providing us with a work such as the present one. F. S. K.

[1] Author's preface.

OUR BOOK SHELF.

The Detection and Measurement of Inflammable Gas and Vapour in the Air. By F. Clowes, D.Sc., and Boverton Redwood, F.R.S.E. Pp. xii + 206. (London: Crosby Lockwood and Son, 1896.)

THIS book describes the evolution of the "hydrogen-lamp" for the detection and estimation of fire-damp in coal-mines, as well as for the detection of other gases and vapours which may form explosive mixtures with air. In an historical introduction, and in various appendices, Prof. Clowes gives an account of the various appliances which have been brought forward for the detection of small quantities of fire-damp, and each method in turn is criticised and condemned in view of the "superior advantages" of the hydrogen-lamp. How far it is desirable for the inventor of a particular process to write a book on the general subject of gas-testing, and to criticise rival inventions in it, need not be discussed; the literary character of the book certainly suffers, as witness the following:—"The advantages of the hydrogen-flame render it so distinctly superior to every other testing-flame, that those who have once become familiar with its use prefer it to all other flames in delicate and accurate testing." This is not taken from a page of advertisements, but is the last paragraph of the "historical summary."

Apart from this one fault we have no criticism to make. Prof. Clowes has put together in a convenient form a number of bits of information useful to mining engineers, and has given full details of his own experiments on a difficult and important subject. The success of the hydrogen-lamp has passed beyond the experimental stage. It is a practical instrument, which we feel confident will lead to increased safety in mining industry. Prof. Clowes shows how the lamp can be used for detecting other inflammable gases, as well as for showing the presence of carbonic acid in the air; and Mr. Boverton Redwood contributes a chapter on its use in detecting inflammable vapour from petroleum. The construction of petroleum-tank steamships has made an accurate test for petroleum vapour necessary, and the hydrogen-lamp of Prof. Clowes has been successfully adapted for this purpose. The book is capitally illustrated.

Mensuration. By Alfred Lodge, M.A. Pp. 274. (London: Longmans, Green, and Co., 1895.)

IN this book the student is assumed to have an elementary knowledge of mensuration, and to know, also, something of elementary trigonometry as far as the solution of triangles; in fact, it is intended chiefly for senior students. In its arrangement, volumes, surfaces, and solids are first dealt with; then follow chapters on spherical lunes. triangles, polygons, regular polyhedra, and plane figures. An interesting chapter is given on the mensuration of such earthworks as would be required in excavating cuttings for roads or railways, and in the construction of embankments. Chapter viii. is confined chiefly to the use of logarithms in solving triangles, while the following one is devoted to the relationship between British and metric measures. A short survey shows that the book should prove serviceable to those readers who wish to acquire a sound knowledge of the theoretical side of this subject. It may be mentioned that in the determination of volumes of solids the formulæ are, for the most part, all based on Simpson's rule. A great number of both numerical and algebraical examples are scattered throughout, and very neat and instructive figures are inserted in the text.

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.*]

Measurements of Crabs.

ON June 11 last, a paper by Mr. Herbert Thomson was communicated to the Royal Society, "On certain changes observed in the dimensions of parts of the carapace of *Carcinus mænas*" (*Proc. Roy. Soc.*, lx. No. 361). According to measurements recorded in this paper, the male crabs taken at Plymouth in the year 1895 were narrower in the frontal breadth, and longer in the right dentary margin than male crabs of the same size taken in 1893.

The author of the paper states that further measurements will be necessary in order to decide whether these results indicate a permanent change in the species at Plymouth, or a mere oscillation, such as may be constantly going on in the relative dimensions of parts in a species.

I venture to remark that species must be much more unstable than we have ever supposed hitherto, if either permanent changes or mere oscillations in their characters are to be detected in one locality in the course of a couple of years. There is one other possible explanation of the observed differences which has occurred to my mind, and is, I think, worth consideration on the part of those who are studying evolution by means of the micrometer. It appears from the paper that the measurements of the 1893 crabs and of the 1895 crabs were made, not in those years respectively, but both sets alike after the summer of 1895. The two sets of crabs were, in this case, not measured under identical conditions. If the 1893 set had been longer in spirit than those of 1895, perhaps this was the reason of the difference. Or there may have been some difference in the mode of preservation. At any rate, I think the comparison is not trustworthy unless the measurements had been made on fresh crabs immediately after they were collected—one set in 1893, the other set in 1895. It is doubtful whether measurements of spirit specimens are ever perfectly trustworthy as representing the true dimensions of animals.

The fact that a deficiency in one dimension was "compensated," as the author himself expresses it, by an excess in the other, suggests the question whether the specimen of one lot or the other had not undergone an artificial change of shape. It seems to me that that question must be disposed of before we admit that a permanent or temporary change in the specific dimensions of parts in the crab has been demonstrated.

J. T. CUNNINGHAM.

Some Effects of the X-Rays on the Hands.

AT the request of the editor of NATURE, I append the following description, compiled from notes, of the effect of repeated exposure of the hands to the X-rays. The result, though perhaps interesting from a medical and scientific point of view, has been most unpleasant and inconvenient to myself—the patient—and although my theories may be incorrect, and my conclusions easy to demolish, there is no mistaking the fact that the X-rays are quite capable of inflicting such injury upon the hands as to render them almost useless for a time, and to leave in doubt their ultimate condition when entirely freed from frequent daily exposure to their influence.

Now for facts. I commenced demonstrating early in May with a coil capable of giving an 8" spark, and have been engaged in the work for several hours per day until the present time. For the first two or three weeks no inconvenience or discomfort were felt, but there shortly appeared on my right-hand fingers numerous little blisters of a dark colour under the skin. These gradually became very irritating, the skin itself very red and apparently much inflamed. The irritation increased, and the application of *aqua-plumbi*, as recommended in a Berlin telegram to the *Standard*, had only a passing effect in allaying it. So badly did my hand smart, that I was constantly obliged to bathe it in the coldest water I could get, and I really believe I should have been obliged to resign my appointment had not a well-known medical man, who happened to attend one of the demonstrations, advised me to use a much-advertised ointment. I did so, with the remarkable result that the irritation left me immediately, and by using it regularly since then, I have at least avoided one of the disagreeable consequences of too much X-rays. In the meantime, however, the skin on the fingers had become very dry and hard, yellow like parchment, and quite insensible to touch, and I was not at all surprised to find, a day or two afterwards, that it began to peel off. When this particularly unpleasant operation had been accomplished, I considered I was quite acclimatised to the rays, but soon found out my mistake. The same symptoms again appeared, the newly-formed skin going the same way as in the former case. But there was a further discomfort to follow. About the middle of July the tips of my fingers began to swell considerably, and appeared as if they would burst. The tension of the skin was very great, and, to crown all, I noticed for the first time that my nails were beginning to be affected. This was the commencement of a long period of really serious discomfort and pain, which was only partly relieved when, from under the nails, there appeared a somewhat copious and unpleasant-smelling colourless discharge, which continued more or less until the old nails were thrown off. With this discharge the swelling in the finger-tips decreased, but as the new and old nails began to separate in the middle, the pain was renewed, and I was unable to bear the slightest pressure upon them. The old nails turned quite black and very hard, and the state of my hands may be imagined when I say that I had to keep the fingers in bandages for more than six weeks. It was only in the middle of August that my left hand became affected by the rays, as until then I had principally used my right hand in the manipulation of the fluorescent screen. I naturally expected to again undergo the same experience, with all its discomforts. I had lost the skin of my right hand for the third time, and there seemed to be no probability of that being the last. Several doctors had seen my hands, and taken much interest in their condition, but no one could suggest a remedy.

At last it occurred to me that all the trouble was being caused by the rays burning out the natural oil of the skin, and that if I could in some way supply the deficiency, it might assist in preventing further ill effects. For that purpose I got some lanoline, the oil obtained, so I am informed, from sheep's wool. This I daily rubbed into my hands, and then encased them in a pair of ordinary kid gloves. These gloves, in the course of time, became saturated with the ointment, and there is no doubt that, although in themselves they were quite transparent to the X-rays, and therefore no shield in themselves, the fatty matter did, in a great degree, prevent the drying up of the skin in the manner I have described. I do not mean to say that it is an absolute preventive, but it goes a long way towards that desirable end, because since I first used the lanoline, now some weeks since, my hands have not again peeled, although at the present moment (October 17) there are a few slight symptoms of it.

My view of the effect of the X-rays is that, in regard to this matter, it is exactly similar to acute sunburn. The symptoms and effect are the same, only that, in the case of the X-rays, you have it in a far more concentrated form—in fact the very essence of it. But whatever may be the cause, the effect is unquestionable. In my case I have had three new sets of skin on the right hand, and one on the left; four of my finger-nails have disappeared on the right, two on the left, and three more are on the point of leaving. For at least six weeks I was unable to use my right-hand fingers in any way whatever, and it is only since the nails came off that I have been able to hold a pen. Of course it will be a month or two before my hands resume their natural condition, and it is yet, as I said before, a moot point as to what the end will be.

I could say much more on this subject, but already I fear I have trespassed too much on the editor's space. I have written this with the object of placing upon record "the strange case of an X-rays operator," in the hope that it may add something to what is known of the new and mysterious power, and lead others, more experienced in scientific and medical knowledge than myself, to devise an effectual preventive against such results as I have described. Many important questions are opened up by this remarkable effect of the rays upon the skin and nails, and it may be that in the near future they may be utilised in cases of skin and other diseases. Who knows? S. J. R.

X-Rays Syndicate, Indian Exhibition, Earl's Court, London.

Habits of Chameleons.

I HAVE just read Mr. Ridsdale's letter about the Chameleon, and write to say that I have one here which has lived in England since May 23, 1891, when it was brought from the Cape by my nephew. I imagine it must be somewhat different to Mr. Ridsdale's specimen, judging from the variations of colour. This one has green as its predominant colour, changing in a bright light to a brown or almost chocolate hue, and at night it is often a bright canary yellow, especially when kept, as it was on its first arrival, in a cage which was painted cream colour inside. Only once have I seen it turn white, and that was when I was just in time to save it from being killed by a cat, and then I suppose it was the result of fear. It frequently has yellowish stripes running along its body, and sometimes round red spots. Not unfrequently one side of its body is of a different colour to the other. It drinks only sparingly, but I saw it do so this morning, putting its head right into the glass with which it is supplied.

After it had been in England about a year it surprised us by laying some eggs, and has done so again within the last few months. The eggs are roundish, about the size of small peas, and of a clear orange colour, somewhat resembling grains of maize. If either Mr. Ridsdale or Mr. Bartlett would like to have one, I should be pleased to send them specimens.

The last time it changed its skin it had the misfortune to lose about half an inch of its tail, from what cause I am unable to say, and this has made it much less able to get about, as the loss deprived it of the little hook at the end of the tail with which it used to cling to the sticks on which it climbs. I never saw it try to help the skin off with its feet, and it has generally come off in flakes, taking a fortnight or so over it.

I think the most extraordinary thing about the reptile is the wonderful way in which the two eyes work quite independently of each other, and enable it to survey comfortably objects in quite opposite directions. A. ALEX. BLAKISTON.

Glastonbury, October 21.

Chameleons at the Zoological Society's Gardens.

MR. RIDSDALE must have mistaken Mr. Bartlett when he states (NATURE, October 15) that there are no Chameleons in the Zoological Society's Gardens. We are seldom, if ever, without examples of these reptiles, and at the present moment have five specimens, three of *Chameleo vulgaris* from North Africa, and two of *Chameleo pumilus* from the Cape. At various times we have exhibited specimens of eight species of Chameleonidæ. I may add that Chameleons generally do not do well in captivity, and require constant attention. P. L. SCLATER.

3 Hanover Square, London, W., October 22.

The Organisation of Technical Literature.

THE "Catalogue of Scientific Papers," compiled and published by the Royal Society of London, was intended to serve as an index to the titles and dates of scientific papers contained in the Transactions of societies, journals, and other periodical works. This Catalogue is highly valuable to all technical inquirers, and it is a matter of deep regret that the International Conference, held under the auspices of the Royal Society of London, has decided that the International Catalogue of Scientific Literature, which is to begin with 1900, is to relate to pure science only, applied science being strictly excluded. It is possibly too late to remedy the position, which is probably due to the absence of representatives of technical societies at the International Conference.

It would seem desirable, further, that there should be a conference of technical societies to discuss the publication of a subject-matter index to technical and scientific periodicals. The Federated Institution of mining engineers has had for some time before it the question of the publication of such an index of subjects of interest to mining and metallurgical engineers; and probably a comprehensive index to engineering and other technical papers would prove more valuable.

This suggested conference of technical societies might also consider other questions which interest technical societies individually, but which they are unable to obtain owing to want of concerted action. Thus, such an association might approach the Government on such questions as the excessive cost of postage of Transactions, as there can be no valid reason why they should not be placed in the same position—although their Transactions are issued at varying intervals of time—by a short Act of Parliament, as an ordinary weekly newspaper.

And there are many other matters, which no doubt crop up in connection with the carrying out of the objects of individual societies, in which concerted action would produce valuable results. M. WALTON BROWN, *Secretary*.

Neville Hall, Newcastle-upon-Tyne, October 21.

A Mechanical Problem.

A MAN stands in a box, whose sides, floor, and top are rigid and inelastic, the box itself being light as compared with the weight of the man, and a few inches higher than himself. The man jumps, and strikes the roof with his hands or head.

Is it possible for him to raise the box in this way (even in a small degree) perpendicularly from the ground? "CROMERITE."

[(1) The box rests on the ground. Therefore the downward push of the man on the box on springing is balanced, and no more affects the motion of the box than if his feet rested on the ground. If his muscular force were great enough, he could give infinite velocity to his body. He is now moving, the box still at rest as before. When his head strikes the top, the rate of destruction of his upward momentum is the upward force on the box, and this depends on the elasticity of his head. If his head is rigid enough he lifts the box, however heavy it may be.

(2) The "argument waged round" the question is possibly based on the idea that the box and man are in free space. In free space, nothing that the man can do will affect the motion of the centre of mass of the whole system (the box-man system); but the box itself moves, so that even in free space "the man moves the box."—J. P.]

Extension of the Visible Spectrum.

WHILE engaged on work in connection with the discharge o. electrification by ultra-violet light, we have come across a fact which it may be convenient to state by itself, viz. that the spectrum of an arc can be made visible over the greater part of its immense range of action on electrified metals, by receiving it upon a screen of the double fluoride of uranium and ammonium, such as is frequently used for displaying X-rays. The arc-light must, of course, be passed through a quartz train, and a long arc is best, especially an arc containing aluminium; but under these circumstances, whereas the ordinary visible spectrum may be three-quarters of an inch broad, a breadth which may be doubled or trebled by the use of ordinary fluorescent substances, the spectrum received upon a uranium screen is five inches broad, and is full of bright lines.

Suitable screens are supplied by Ducretet of Paris, or by Chadwick of Manchester, or they can be readily made; and any one possessing either a Rowland grating, or a quarter prism and lens, can try the experiment.

It is just possible that it has not been noticed, to the full extent, before. OLIVER J. LODGE.

Liverpool, October 26. BENJAMIN DAVIES.

ON THE COMMUNICATION OF ELECTRICITY FROM ELECTRIFIED STEAM TO AIR.[1]

THE experiment described in this paper was a first slight instalment of an investigation, which we have proposed to make, of the diffusion of electricity through air, and the communication of electricity from the molecules of one gas to the molecules of another beside it or mixed with it.

By arrangements, readily imagined, we electrified dry superheated steam at atmospheric pressure by a needle-point connected with an electric machine. The dry electrified steam was drawn off through a tube with an inlet admitting unelectrified air to mix with the steam. The mixed air and steam were drawn off through the metal worm of a still, and cooled by an abundance of cold water around the worm. The condensed water fell into a Wolff's bottle, in one neck of which the exit tube of the worm was fixed. The air, thus cooled and partially dried, was drawn out of the other neck of the Wolff's bottle through a drying tube of pumice and sulphuric acid; and thence through a short paraffin tunnel to one of our electric filters,[2] insulated and connected with the

[1] Abstract of communication to Section A of the British Association at Liverpool (September 21), by Lord Kelvin, G.C.V.O., F.R.S., Magnus Maclean, and Alexander Galt.

[2] "On the Diselectrification of Air," *Proc. R.S.*, March 1875.

insulated electrode of a quadrant electrometer. Through a second paraffin tunnel, at the other end of the filter, and a connecting pipe, the air is drawn off by an air-pump. All the metal of the apparatus, except the filter, and except the electrometer-vane, is connected with the metal case of the electrometer.

We were much interested to find, as we expected, that the steam gave up a large part of its electricity to be carried away by the air, while it itself was left behind in the Wolff's bottle and the sulphuric pumice. We tried the experiment both with positive and negative electrification, and found it equally successful in the two cases.

A full description of the experiment, with drawings representing the apparatus, is given in a paper, on the electrification of air and other gases, which we hope to communicate to the Royal Society at its first meeting in November.

THE NOVEMBER METEORS.

AS the lapse of time brings us nearer to the maximum of these phenomena, the interest in this branch of astronomy is intensified, and our liveliest expectations encouraged. These meteors only return in their richest abundance once in thirty-three years, so that the spectacle they afford can only be witnessed once in a generation. It is true that the shower may be manifested in a pretty conspicuous manner in several successive years, but only one really brilliant exhibition is usually seen, as on the mornings of November 13, 1799, and 1833, and November 14, 1866. Two years before the maximum and three years after it, striking displays have occurred, and show that the orbit of the meteors is very thickly strewn with these bodies over a considerable arc, since it takes six years for them to cross the earth's track, though travelling at the rate of about twenty-six miles per second.

Every one who has watched a great meteoric display, will admit that there is no other celestial spectacle which can compare with the striking aspect it presents. Those who have seen an event of this kind often recall its vivid characters, and look forward to the prospect of re-observing it. Others who have never witnessed it have heard or read the descriptions of people who have been more fortunate, and are anxious to behold so impressive and wonderful a phenomenon. Apart from being an attractive sight to the popular eye, it is a most important event from a scientific point of view, and the regular recurrence of this fine shower has been the means of largely augmenting our knowledge of meteoric astronomy.

The all-important question now is, "Will the display be repeated this year in an imposing form, and merit close attention from the casual observer as well as the professional astronomer?" A definite answer can scarcely be given, for our knowledge of this particular system of meteors is not sufficiently extensive to enable us to speak with certainty. Changes are doubtless affecting the stream, and the effects are cumulative; thus the circumstances attending the ensuing return will be somewhat different to those which controlled those of 1833 and 1866. The meteors are probably lengthening out along the orbit owing to the differences in periodic time amongst them, and the stream is widening as an effect of planetary perturbation. Thus in future ages the shower will probably return in many consecutive years near the epoch of maximum, while the maximum itself will be less brilliant than in former times, unless, indeed, on an occasion when the earth crosses the meteor orbit at a point very near the parent comet of Tempel (1866 I.) forming "the gem of the ring." The shower will probably last for several weeks in a feeble character, owing to the disturbances set up by the earth during its frequent immersions in the stream. The latter must evidently be undergoing a gradual process of thinning out, since our atmosphere destroys by combustion such of the particles as enter into it, and the number so destroyed must amount to many millions whenever a rich shower occurs. Still, in comparison with the enormous number of meteors comprised in the whole system, the proportion caught and vapourised by the earth must be extremely insignificant. After a long series of years the Leonid display, like that from Perseus in August, will probably become a pretty rich annual shower, and lose much of the grandeur which has attended it at intervals of about thirty-three years in the past.

From various observations obtained in November 1895, there was no sign of development in the Leonid meteor shower. The number seen did not exceed those counted in 1879 and 1888, when we were much further removed from the maximum. On the morning of November 14, not more than five Leonids per hour were counted at any station in England, and the display was therefore of very ordinary character. If, however, it failed as regards numbers, it exceeded expectation in respect to duration, for on the morning of November 17, Mr. Corder saw twelve Leonids out of twenty-two meteors counted in the two hours between 4h. 15m. and 6h. 15m. a.m., and on November 18, he observed eight Leonids out of thirty meteors seen in three hours between 2h. and 5h. a.m. Next month there is a far greater probability that we shall see a display at least much above the average, as we are twelve months nearer the maximum epoch, and this should make all the difference. But as we cannot expect the richest exhibition until 1899, we are still three years in advance of the important time, and are scarcely justified, from the prevailing conditions, in anticipating a brilliant revival of the shower this year. Conspicuous displays occurred in 1831 and 1864, two years before maxima, and in 1897 the shower is likely to develop considerable strength, increasing in 1898, and culminating in 1899. In 1863, three years prior to the magnificent return of 1866, not a great number of meteors were seen, but there is evidence that the Leonids formed a tolerably important shower. Mr. T. M. Simpkiss, of Wolverhampton, counted about ninety meteors in one and a half hours between midnight and 1h. 30m. a.m. on November 15, 1863, and from their streaks and directions it was evident the majority of them emanated from the constellation Leo. Very few were observed on the nights of the 12th and 13th, and during the hour from 11h. to 12h. on November 14, Mr. Simpkiss had only counted ten meteors.

The prospect is a fair one that the shower will return on the mornings of November 14 or 15. There appears, however, to be little probability that it will be very brilliant; but it is likely to furnish forty or fifty meteors an hour at the time of its best presentation, and to rival a fairly active return of the Perseid shower. It will be most important to watch its progress, to determine the degree of its activity and length of duration. From my observations in past years, the Leonid radiant appears to be feebly visible from November 9 to November 19, and may be extended beyond those dates. This year the moon will partly interfere with observation setting as follows:—

		h. m.		Age at noon. d. h.
November 12	...	11 38	...	7 5
,, 13	...	12 50	...	8 5
,, 14	...	13 59	...	9 5
,, 15	...	15 9	...	10 5
,, 16	...	16 19	...	11 5

Watches for shooting-stars should therefore be commenced at midnight on the morning of the 13th, at 1 a.m. on the 14th, at 2 a.m. on the 15th, and at 3 a.m. on the 16th. Amongst the features to be specially observed during the progress of the shower may be enumerated the following:—

(1) The time of maximum frequency.
(2) The horary number of Leonids visible.

(3) The position of the radiant point.

(4) The character of the radiation, whether sharply defined or diffuse and scattered over an area.

(5) If an area, find its diameter, and if possible its shape, whether elliptical or round.

(6) The apparent brightness of the meteors, how many are equal to, or brighter than, first magnitude stars.

(7) The duration of the active display.

(8) The duration of the entire shower.

(9) Does the radiant point, as derived on several nights of observation, retain a fixed position or move eastwards amongst the stars? In investigating this feature, it will be necessary to observe the place of the radiant on each night of the shower's visibility. Four or five meteors, if accurately recorded and in or near Leo, will generally be sufficient to indicate a correct position. On nights when the shower is very rich, it will be a good plan to get the radiant from successive half-hourly or hourly intervals, and then, from these independent observations, to derive a mean position for the night.

(10) The duration of the meteor flights in individual cases.

(11) The proportionate number of Leonids leaving streaks to the total number counted.

(12) The time of duration of the streaks. In the case of streaks lasting for some minutes, their drift amongst the stars should be noted.

(13) The colour of the meteors and of their streaks.

There are some other points, but these are among the most important.

As to the numerous minor showers of the period, these must be neglected if the desire is to specially observe the Leonids. Many Taurids are usually seen at the middle of November, but these are easily distinguished from the Leonids, as they move slowly and rarely leave streaks; moreover, their radiant point is placed in a different quarter of the heavens.

To adequately observe and record a meteor shower, at least two persons are necessary, for it is quite impossible for a single observer to give proper attention to all the features. He cannot register the apparent paths and count the number of meteors visible, as his attention will be frequently withdrawn from the sky, and many meteors will altogether elude him. To determine the maximum time of a shower, the observer's attention must be continuously directed to the heavens, and he must carefully note at intervals, say of five minutes, the number of meteors seen. To chart the observed tracts, to determine the radiant, and to note a few other features, quite monopolises one person's attention, and requires an extensive experience for the work to be done properly. Whenever a special meteoric display such as the Leonids is intended to be observed, the services of an assistant are necessary to reckon the visible number of meteors, and determine the time of their maximum frequency. Though the ensuing return of Leonids is not likely to be sufficiently important to call for special effort, there is need of our being prepared, as it may exceed expectation and should be suitably recorded, and it will be sure to offer many interesting facts for observation and discussion.

W. F. DENNING.

THE INTERNATIONAL METEOROLOGICAL CONFERENCE IN PARIS.

AS has already been announced, this meeting was held in September, under the presidency of Prof. Mascart, and lasted seven days (September 17–23, inclusive). The last meeting of a similar character had been held in Munich in 1891. The Paris meeting was attended by some forty members. Canada and Mexico were represented for the first time; neither Spain, Portugal, Brazil, nor the Argentine States were represented. The Weather Bureau, Washington, sent no one; Mr. Page came from the Hydrographic Office, Washington, but only in a private capacity.

Dr. Hann's absence from the meeting, on the ground of health, was universally regretted.

The programme for discussion consisted of over forty questions, and to these Mr. Wragge, of Brisbane, proposed to add more than a score; but several of his applications were ruled as *ultra vires* for the Conference. Some of the questions on the programme were set aside as either reopening discussions which had been closed years ago, or as being impossible of acceptance; as, for instance, one as to the adoption of a period of 26·67928 days for all meteorological and magnetical phenomena.

The business really done was, briefly, as follows:—

Committees were appointed, as already announced (NATURE, October 1), to carry on investigations into (1) terrestrial magnitudes and atmospheric electricity; (2) cloud observations; (3) balloon ascents; (4) sunshine and radiation.

It was recommended, at the suggestion of Mr. Symons, that systematic comparisons of different forms of thermometer exposure be carried out generally, Assmann's apparatus for ventilating thermometers to be one of the forms tested.

The Conference declined to make any recommendation as to a standard anemometer, or as to anemometer exposure.

Several applications were made to the Conference to exert, by resolutions, pressure on Governments with the view of the obtaining of grants for investigations; but these were all ruled as *ultra vires*. Mr. Wragge's requests for stations in Tasmania, and for observations on Mount Wellington, Tasmania, and also on Mount Kosciusko, in Australia, were met by the general declaration that the Conference must welcome the establishment of good stations all over the world.

Dr. Neumayer's proposals to modify existing systems of meteorological telegraphy in Europe were not accepted.

Four questions as to the discussion of phenomena in cyclones were held to be purely theoretical, and therefore unsuitable for discussion at a Conference.

Prof. Mohn submitted some proposals as to the use of the hypsometer. No discussion ensued, but Prof. Mohn's paper will be printed in the appendix to the Report of the Conference.

Dr. Paulsen, of Copenhagen, exhibited monthly ice charts of the North Atlantic, north of the 60th parallel, and received a promise of assistance in their completion from the members present, who were in a position to obtain observations of ice.

Dr. Snellen, of Utrecht, requested the Conference to take measures for convening a new Maritime Conference, to carry on further the work done at the London Conference of 1874. This matter was referred to the International Committee.

The chief feature of the Paris meeting was the attention paid to terrestrial magnetism and atmospheric electricity. The Committee appointed for these subjects held three meetings, of which the minutes will shortly appear; and, as has already been stated, a Committee has been nominated to carry on the discussion of various points which have been raised.

Finally, the International Meteorological Committee has been reappointed with a few modifications, owing to resignations, &c. Its members now are—

Dr. von Bezold (Germany).
Dr. Billwiller (Switzerland).
Admiral Capello (Portugal).
Mr. Davis (Argentine Republic).
Mr. Eliot (India).
Hofrath Hann (Austria).
M. Hepites (Roumania).
Prof. Hildebrandsson (Sweden).
Prof. Mascart (France), *President*.
Prof. Mohn (Norway).
Prof. W. L. Moore (United States).
Dr. Paulsen (Denmark).
Mr. Russell (New South Wales).
Major-General Rykatcheff (Russia).
Mr. Scott (England), *Secretary*.
Dr. Snellen (Holland).
Prof. Tacchini (Italy).

ROBERT H. SCOTT, *Sec. Int. Met. Committee.*

MARS AS SEEN AT THE OPPOSITION IN 1894.

SOME three years ago, M. Camille Flammarion's classical book on the "Planet Mars" was noticed in these columns (NATURE, vol. xlvii. p. 553). This work was a compilation of all the observations made up to that period from the very earliest record, and a thorough discussion of them was given, as was to be expected, in a masterly way. Since that time, however, the planet's surface has been studied by observers in numerous parts of the world, and their observations have been published 'n various journals and in different languages. Perhaps the most important, or at any rate the most consecutive series, of such observations hails rom Flagstaff, Arizona, Mr. Percival Lowell having, at great expense, equipped himself with some fine instruments, and set out for that region to make a systematic study of the surface markings during the opposition of the planet in the year 1894.

It may at first be asked why an observer should choose a place so far away, when most excellent instruments of large aperture are at work nearer home. This question may be answered in a few words. For a study of planetary details, a steady atmosphere is the most essential thing to be secured; the size of the instrument, as Mr. Lowell says, being a matter of quite secondary importance. To convince ourselves we have only to recall the fact how Schiaparelli, with quite a moderate aperture, made numerous discoveries as regards the canals and their doubling, when no one, even with apertures double that of his telescope, could detect the delicate tracery that he saw. It is well known among astronomers that this observer has a marvellously keen eye for observation, but even this would not account for these great differences.

Mr. Lowell, however, wished to set up his instrument under the very best conditions obtainable; and this is why he finally settled upon Arizona, as not only was the planet observable near the zenith there, but observation showed that the air was as pure and as still as he could find anywhere. The result has been that he was able to work from May 24, 1894, to April 3, 1895, practically without a break of any importance during the whole of this period, and the result of his labour will be found in the first volume of the *Annals* of his observatory. This volume, as one would naturally suppose, contains the original data set out in great detail, but practically too technically for the general reader.

For a more general account of the observations, and the results to be drawn from them, we are indebted to him in his book "Mars,"[1] which has been recently published, and of which we propose to give some account n the present article. It must be remembered, before proceeding, that in this volume the observations are confined to those made at Flagstaff by Mr. Lowell, and associated with him Prof. W. H. Pickering and Mr. A. E. Douglass.

It may be thought at first that any book on Mars, to take a high place in the literature on planetary astronomy, must refer to a great extent to the previous work done by other observers. This, certainly, should generally be the case, but there may occasionally be exceptions, and this is one of them, when such a treatment would divert the aim of the book in question. What Mr. Lowell here does is to discuss his own beautiful series of observations (a series quite unique as regards the number of consecutive days of observation), and to make, if possible, plausible deductions from them. Personal equation seems to play a very important *rôle* in the observation of planetary detail, so the more this element is eliminated by dealing with observations made by one man with one instrument, the more should our knowledge o changes, if they occur, be advanced.

[1] "Mars," by Percival Lowell. (London: Longmans, Green, and Co., 1896.)

The subject-matter of this book is divided into six subheads, and we cannot do better than consider each separately. First, then, as regards the general characteristics of the planet's disc. Here we shall limit ourselves, and only refer to the shape of the planet, as an interesting discovery has been made with regard to it. The disc of Mars generally appears perfectly round, but nevertheless it is to some extent flattened at the poles. Nearly all the measures of it have resulted in giving a rather larger value for this flattening than theory seemed to allow. The reason underlying this apparent discrepancy was first noticed after a careful series of measurements of the polar and equatorial diameters. The explanation given, which seems to agree with the facts very well, is that at the edge of the disc there is a fringe of twilight, which affects unequally the equatorial and polar diameters. The equatorial diameter is apparently always too large, and suffers variations due to the different positions of the sun; while in the case of the polar diameter the variations are much less. Under "Atmosphere," the title of the second chapter, this point is again referred to: that we are dealing with an effect of the air, and not one due to mountains, is accounted for by the systematic changes the measured diameters show, which are functions of the sun's position. Calculation shows that the minimum arc of twilight amounts on Mars to 10°.

That Mars possesses an atmosphere has long been known, and indeed it would be difficult to account for the changes that take place on his surface without the intervention of such a medium. This atmosphere is further described as being remarkably free from clouds, a cloud being "a rare and unusual phenomenon." This result is somewhat out of harmony with previous observations, clouds, or what looked very much like them, having been recorded as being distinctly seen passing over and blotting out, locally and temporarily, from view the surface markings.

Mr. Lowell, however, does not say that clouds do not exist there, but that they simply, during the whole time of observation, never blotted out any markings. He admits, however, that the planet's disc has appeared at times unaccountably bright, and that small bright spots have been observed, but nothing in the shape of moving masses in the atmosphere has attracted attention. That there are clouds in the atmosphere he deduces from certain phenomena visible only at the terminator, and observed by Mr. Douglass. During the opposition no less than 736 irregularities on the terminator were observed. The peculiarities of these lie in their shape and distribution: some are projections, others depressions. That they are due to mountains seems, according to Mr. Lowell, to be very improbable when all the facts concerning this planet are taken into account; but that they may be due to clouds, seems more possible. Mr. Lowell discusses this point at some length, and finally considers that these irregularities must be produced by the presence of the latter.

It is perhaps on this point that Mr. Lowell differs most from other observers of Mars. The bright lights seen on the terminator since 1890 seem to indicate the presence of mountains on the Martian surface, so that deformations at the terminator would seem to be more probably due to these than to the assumption of cloud-banks.

We come now to the third chapter of the book, the question of water, and under this heading the polar cap, areography, and seas are discussed. About the first there is little to note. The whole polar area was watched minutely, and found to disappear entirely, an occurrence never before chronicled. During these observations there was always seen a broad blue belt following the cap as it retreated towards the pole, showing that water was actually being formed from the melting of the snow, and the spots, recorded by Green and Mitchell, were also seen; these were found to consist of land at a higher level than that in the surrounding neighbourhood, and formed of ice-clad slopes which reflected brightly the solar rays.

To place before the reader the different Martian features, Mr. Lowell has adopted a very simple and ingenious plan. He has plotted upon a globe all the details that have been seen at his observatory, and photographed the globe down from twelve different points of view, the negatives being then made "to conform as near as possible to the actual look of the planet." Under "Areography" then the reader makes, so to say, a trip round the planet, each of the most important markings being described in the text. The wonderful network of the canals is almost startling, so clearly do they stand out, and the amount of detail observed surpasses anything that has as yet been done.

In the two illustrations (Figs. 1 and 2) which we reproduce, the reader can see for himself the network of canals and the "oases" at the points of intersection of the canals. The drawings show clearly the canals on the darker portions of the surface markings, quite a modern addition to Martian cartography.

must be on a gigantic scale. If there be inhabitants, then, as Mr. Lowell says, "irrigation must be the chief material concern of their lives."

Turning our attention now to those markings known as canals, we seem to have before us what appears to be a most perfect system of irrigation that could be conceived. These canals form a regular network all over the planet's surface, and apparently pass through the dark as well as the lighter portions of the disc, as gathered from observations of both Messrs. Douglass and Schaeberle. Since they have been so often described before, it is unnecessary to do so here; but one may remark that their number has been considerably increased (more than doubled). Further, at the points were the canals meet one another, there have been observed, in every case, to be spots present. These latter have never been seen isolated: "There is apparently no spot that is not joined to the rest of the system, not only by a canal, but by more than one." The canals and spots further always appear to grow together (see accompanying figures).

Now these canals are not always visible on the surface of the planet; they appear to depend upon the seasons. Observation shows that they undergo a distinct develop-

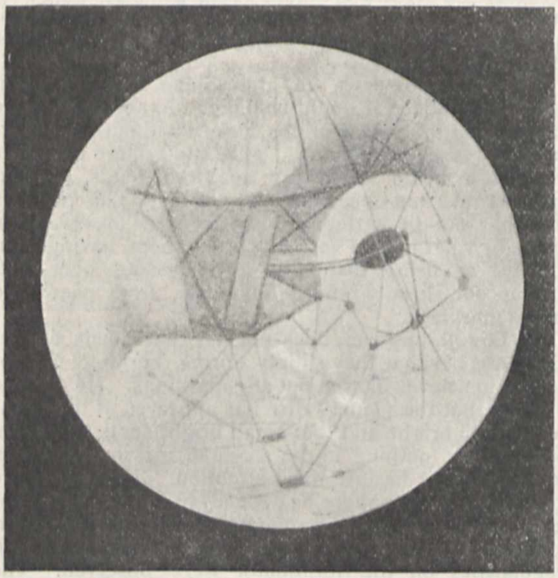

FIG. 1.—Showing the region about the Lacus Solis. Longitude 60° on the meridian.

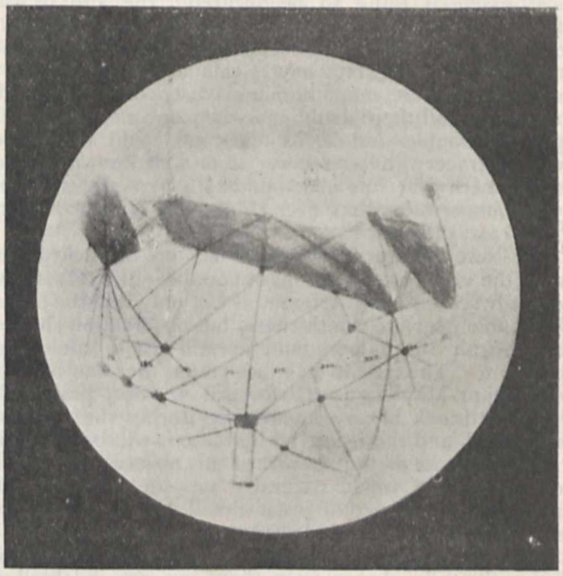

FIG. 2.—The region about Mare Cimmerium and Trivium Charontis. Longitude 210° on the meridian.

With regard to the so-called "Seas," that is, the blue-green areas, we are told that important facts conspire together to throw grave doubt upon their aquatic character. The two chief of these are, first, that hundreds of thousands of square miles of them disappear in an amazingly short space of time; and, second, that polariscope observations give no indications of polarisation. Two questions then arise: first, where then does all the water, formed from the melting of the polar cap, go? and what are, then, these blue-green areas? The latter are, according to Mr. Lowell, areas of vegetation, and they have been observed to alter their tints as the seasons on the planet progress; he suggests, however, that they were probably once seas, but the supply of water has now so diminished that it only flows in the deepest channels. He defines them as being at present midway in evolution between the seas of our earth and those of the moon.

With such a state of affairs, a small water supply, the inhabitants of Mars must, to exist, have a very elaborate and scientific means of utilising every drop they can procure; or, in other words, their system of irrigation

ment, and it is here that a clue may be found to their origin. Let us regard this "development" as seen and recorded by Mr. Lowell. A canal, according to him, alters in visibility for some reason connected with itself; it grows into existence, but is always constant in position. Their visible development apparently follows the melting of the polar snows. They become distinct when the melting has considerably progressed, and more so as the season advances. Those which are visible first lie to the southward, *i.e.* nearer to the south pole. It may be mentioned here that the southern pole was tilted during this opposition towards the earth. Latitude and proximity to dark regions are the two main factors for early visibility. Canals running north and south generally become visible before those running east and west.

With regard to the doubling of the canals, Mr. Lowell's observations have led him to discover that this does not occur all of a sudden, as has generally been understood, but that there is an apparent mode of development in the process.

In the case of the Ganges, he says: "Hints of germination were visible when I first looked at it in August. . . . By moments of better seeing its two sides showed darker than its middle; that is, it was already double in embryo, with a dusky middle-ground between the twin lines. In October the doubling had sensibly progressed . . . the ground between the twin lines had grown lighter. By November the doubling was unmistakable."

Let us now turn again to the canals, and see what explanation Mr. Lowell gives to account for their origin and subsequent duplication. The idea he adopts is one that has already been suggested by Schiaparelli and Pickering, namely vegetation. The water in its passage from the pole fills a canal, and thus irrigates the country on both sides for agricultural pursuits. The actual canals themselves we do not see; but at a later period the vegetation raised thereby becomes apparent, which gives us the visible canals. The darker lines which cross the dark markings, or the more permanent areas of vegetation, represent also a more advanced growth of vegetation, caused by the supply of water, which passes on its journey to fill those in the brighter regions. Observation at Flagstaff has shown that "there is no canal in the dark areas which does not connect with one in the brighter regions."

So much, then, for the canals and their origin; but how about their apparent duplication? Mr. Lowell, however, has little to say on this point.

"Exactly what takes place . . . I cannot pretend to say. It has been suggested that a progressive ripening of vegetation from the centre to the edges might cause a broad swath of green to become seemingly two. There are facts, however, that do not tally with this view."

From the above extract, it will be seen that Mr. Lowell does not like to commit himself to any statement in explanation of this phenomenon—at any rate, not at present. There seems, however, many reasons to believe that if the canals be due to vegetation, then their doubling is most probably the results also of vegetation; how this comes about is, however, still a moot point.

One of the best instances we have on the earth, of a large strip of land being fertilised once a year directly by an inundation of a large river, is that of the Nile valley. In following, however, the phases which the country on each side of her banks undergoes at the time of and after the flood, it is difficult to account for the development of the duplicity as observed on the Martian disc. Perhaps the irrigation scheme on the surface of Mars has been carried to such an extreme degree of development, that smaller parallel canals on each side of, and some distance from, the larger ones have been constructed so as to become filled and eventually cut off from the main canal when the water commences to recede. In this way the land would be best fertilised at first on the banks of the main canal, but at a later date on those of the smaller canals. The appearance of a canal should then begin by being single; as time went on it should broaden, and eventually become double, the two most fertilised strips being parallel, but at some distance from the main canal. The connecting channels between the main and lateral canals, or rather, the vegetation along these lines, would most probably be invisible on account of their extreme shortness.

Such an explanation as this overcomes the difficulty that there are some canals that do not appear double. One has only to assume that the side canals in these cases have not yet been constructed, and duplicity is on this hypothesis impossible. Whatever the real explanation may be, it is certain that greater attention must be paid to the actual development and fading, before this problem can be looked upon as really solved.

In conclusion, we cannot help remarking on the very logical handling of the subject in this volume. The author makes out, further, a very good case for the hypothesis of "vegetation," which will be hard to oppose. It does seem, however, rather premature for him to draw such decided conclusions from this, his first large series of observations; but his own words show that even these views may be considerably changed by future observation, and he has not, therefore, tied himself too fast to them. In the chapter on the germination of the canals, he remarks that "perhaps we may learn considerably more about it at the next opposition. At this the tendril end of our knowledge of our neighbour we cannot expect hard wood."

The observations of Mr. Lowell have, nevertheless, added greatly to our knowledge of the surface-markings on this planet, and astronomical science owes him a debt of gratitude for the energy he has displayed in fitting out and conducting this expedition, that has been rewarded with such interesting and valuable results.

The book itself not only appeals to professional astronomers, but should be read by all those interested in observations of Mars, for it is written in language that will be found comprehensible even to the uninitiated. The illustrations, which are numerous, are by no means lacking in quality, and considerably enhance the value of the book.

WILLIAM J. S. LOCKYER.

THE SCIENTIFIC DEPARTMENT OF THE IMPERIAL INSTITUTE.

THE extended organisation of the experimental branch of the Scientific and Technical Research Department of the Imperial Institute is now nearly complete, and the whole of the west corridor of the second floor is occupied by well-equipped laboratories, instrument rooms, and sample examination rooms, whilst the recently appointed staff of skilled chemists is already engaged in the scientific and technical investigation of numerous Indian and Colonial products, which are likely to prove of commercial importance or of scientific interest.

The winter course of lectures will be opened on Monday, November 9, at 8.30 p.m. with a discourse by Prof. Wyndham Dunstan, F.R.S., the recently appointed Director of the Scientific Department, the subject of which will be "Illustrations of some of the work of the Scientific and Technical Research Department of the Imperial Institute." After the lecture the research laboratories of the department will be open for the inspection of visitors, and a number of interesting exhibits will be on view.

On November 16, Mr. William Crookes, F.R.S., will deliver the first of two illustrated lectures on the "Diamond Fields of Kimberley," in connection with which a number of specimens and experiments of great interest will be shown. Among other topics Mr. Crookes will discuss the nature and probable origin of the diamond, and will give an account of recent researches of his own. On the occasion of the first lecture, Lord Loch will preside.

On the two remaining Monday evenings in November, illustrated lectures will be given by Prof. J. W. Judd, C.B., F.R.S., the Dean of the Royal College of Science, on "Rubies, Natural and Artificial, with special reference to their Occurrence in the British Empire" (November 23), and by Dr. J. H. Bryan, F.R.S., on "Flight, natural and artificial" (November 30).

Succeeding lectures, the dates of which will be duly announced, will be given by Prof. A. H. Church, F.R.S., Professor of Chemistry to the Royal Academy, on "Some Food-grains of India"; by Dr. Schlich, C.I.E., of the Royal Indian Engineering College, Cooper's Hill, on "The Timber Supply of the British Empire"; by the Hon. W. Pember Reeves, Agent-General for New Zealand, on "The Hot Springs District of New Zealand";

by Colonel Watson, R.E., on "Schools of Modern Oriental Studies"; by Mr. A. Montefiore Brice, on "The Results of the Jackson-Harmsworth Expedition"; a course of three lectures, by Dr. J. L. W. Thudichum, on "The Nature and Manufacture of Wine, with special reference to Colonial Wines"; by Mr. J. Norman Lockyer, C.B., F.R.S., on "How the British Empire aids in Solar Inquiries"; by Prof. W. E. Ayrton, F.R.S., on "Sixty Years of Submarine Telegraphy"; by Mr. Spencer Pickering, F.R.S., on "The Woburn Experimental Fruit Farm." These lectures are open to Fellows of the Institute, and to persons introduced by them.

We warmly congratulate the Executive Council on the new departures. The acknowledgment of the importance of science on the part of the Governing Body comes none too soon.

Much remains to be done in this direction before the Institute can be held to fill the place which many of its best wishers consider it ought to occupy.

FRANÇOIS FELIX TISSERAND.

IT is impossible that we should have learnt the death of an astronomer so eminent as M. Tisserand, the Director of the Paris Observatory, without feelings of the deepest regret, yet its terrible suddenness lends an added note of pathos to the melancholy event. From the report of the Paris correspondent of the *Times*, it appears that on the evening of Monday, October 19, M. Tisserand was present at the dinner celebrating the signing of the marriage contract of the son of the late Admiral Mouchez. On the following morning, apparently without the slightest warning, M. Tisserand expired, the cause of death being congestion of the brain. Astronomy, not only in France, but wherever the science is studied, has thus sustained a tremendous and irreparable loss, and especially will sympathy be extended to the members of the staff of the Paris Observatory, who, twice within a few years, have been deprived of their chief.

François Felix Tisserand was born in the department of Côte d'Or on January 15, 1845. He entered the Normal School at Paris in 1863, and in 1868 gained his Doctorate in Science. Although elected an *agrégé* in 1866, he did not take up the duty of giving instruction, but joined the staff of the Imperial Observatory as assistant astronomer. In 1873, the astronomical service was reorganised by M. Le Verrier, and M. Tisserand was nominated Director of the Toulouse Observatory, and Professor of Astronomy in the Faculty of Sciences of the same town. Subsequently he became Professor of Theoretical Mechanics at Paris, but was transferred, in May 1883, to the chair of Mathematical Astronomy. In this year he began that series of lectures at the Sorbonne, the delivery of which has been attended with the happiest results, for these lectures, given first as the deputy, and subsequently as the successor to M. Puiseux, led eventually to the preparation of that great work with which M. Tisserand's name will ever be connected, the "Traité de mécanique céleste." Though engaged for some twenty years on this work, and necessarily much occupied with official duties, his energy was not exhausted, nor his services to science limited by this task, which few men could have undertaken and brought to a successful issue. In 1874, he accompanied M. Janssen to Japan for the purpose of observing the transit of Venus, and a few years later he was charged with the duty of completing Delaunay's "Théorie de la Lune." Some of the results of this close study of Delaunay's work are shown in the third volume of the "Traité," in the chapters entitled "Réflexions sur la théorie de Delaunay."

M. Tisserand's original memoirs and papers, the most important of which were contributed, though not exclusively, to the *Comptes rendus*, indicate a remarkable activity, and even an exceptional versatility, if that be possible within the range of astronomical science. These papers are far too numerous to mention in detail, but among them are valuable contributions on the theory of interpolation, on problems presented by the minor planets and meteors, on observations of sun-spots, &c. While at Toulouse, M. Tisserand made a collection of exercises in the infinitesimal calculus, which he published in 1876. But the subject with which M. Tisserand's name will always be associated is Celestial Mechanics. The first volume of his "Traité de Mécanique céleste" appeared in 1888; the fourth, which was understood to be the last, has very recently been placed in the hands of astronomers. This is not the place to attempt any analysis of that great work, of which perhaps it is not too much to say, that it will render a similar service to the astronomers of the next century, that the work of Laplace did to those of the last. Herein will be found a unique collection of methods, exhibiting great elegance in the mathematical formulæ, and everywhere enriched by critical and historical reference to the original work of other masters in particular departments. This work will always stand as a worthy monument to the memory of its author.

In 1892, on the death of Admiral Mouchez, M. Tisserand was selected to fill the position of Director of the Paris Observatory. This appointment carried with it, almost of necessity, that of the Presidency of the *Comité permanent*, to whom is entrusted the details connected with the preparation of the *Carte du Ciel*. How loyally he has struggled to give impetus to the scheme that his predecessor had so much at heart, is shown by the various reports which he has presented to the Council of the Observatory, and of which summaries have appeared from time to time in NATURE. Under his auspices, a bureau for the measurement of negatives has been established or extended, additional instruments have been provided for measurement, and energy and progress have everywhere marked his short rule. He has struggled manfully with the arrears of meridian observations, and had schemed a plan of publication reaching as far as 1899. While thoughtful of the necessities of the old astronomy, he has not been unmindful of the new, as the free hand given to M. Deslandres, and the work emanating from the spectroscopic department, abundantly prove. Cut off at the early age of fifty-one, and after so short an occupancy of the post of Director, he has perhaps not had full opportunity to declare his capacity in many directions, but he has done more than enough to justify his selection to the important post he filled, and to furnish a model to his successor. For he worthily upheld the traditions of the institution; and it is not saying too much, although it is saying a very great deal, when we affirm that he was a worthy successor in the line of illustrious astronomers who had preceded him in the control of the Paris Observatory. He had received an abundance of honours, too long to fully enumerate, for the scientific societies of all nations were proud to enrol him among the list of their honoured associates. He was decorated with the Legion of Honour in 1874, and four years later succeeded Le Verrier among the full members of the Academy. He was a member of the Bureau des Longitudes, and held other positions of dignity and credit. The St. Petersburg Academy voted him the *Prix Schubert*, and the Royal Astronomical Society elected him a Foreign Associate in 1881.

W. E. P.

DR. HENRY TRIMEN.

THE friends of Henry Trimen who saw him during his last visit to England—a twelvemonth ago last summer—would not be altogether unprepared for a serious turn in the malady, or rather maladies, from which he suffered; yet the news of his death on the

16th inst. came as a surprise, even to those best acquainted with his condition. For several years he suffered from deafness, which at length became absolute, and then gradual paralysis of the lower limbs set in. This terminated not long since in utter helplessness so far as his legs were concerned, and functional complications arising, he succumbed sooner than was expected. He bore his afflictions with wonderful fortitude, and even cheerfulness; and his only desire was to be spared to complete his great work, the "Handbook to the Flora of Ceylon." But this was not to be. It is to be hoped, however, that a competent botanist will be found to complete this important and admirably-planned publication.

Henry Trimen was born in London in 1843, and educated at King's College. In 1865 he graduated M.B., but he never practised medicine. His favourite study was botany, and he at first specially devoted himself to the British flora and the sources of vegetable drugs. In 1867 he was appointed Lecturer on Botany at St. Mary's Hospital Medical School; and in 1869, he entered the Botanical Department of the British Museum as senior assistant. In the meantime he had published a number of contributions to British botany, chiefly relating to the flora of Surrey, of Hampshire, and especially of Middlesex. His first work appeared in the *Phytologist* in 1862. Soon he became acquainted with W. T. Thiselton-Dyer, the present Director of Kew Gardens, and the result was their admirable "Flora of Middlesex," published in 1869. This work still holds a position in the first rank among county "Floras." In 1866, Trimen discovered *Wolffia arrhiza* at Staines; the first locality recorded for it in England. It was in that year that the writer became acquainted with Trimen and his associate, and made various excursions with them collecting materials for their "Flora." In 1870, Trimen joined Dr. B. Seemann in editing the *Journal of Botany*, and on the death of the latter he assumed the full responsibilities of editor, which he continued to exercise until he went to Ceylon. Concurrently he was conducting his investigations in medical botany, and he associated himself with Robert Bentley in the publication of an illustrated work on "Medicinal Plants"—a work of much research, comprising four volumes containing upwards of 300 coloured plates. Passing over many minor events, we come to the period when he was appointed to succeed Dr. Thwaites in the important and onerous duties of Director of the Botanic Gardens of Ceylon—duties he discharged in a manner satisfactory to the home authorities and the colonists. His annual reports are models of what such reports should be. He at once took up the study of the native flora, and was soon actively engaged in the introduction of valuable economic plants of other countries for cultivation in Ceylon. The first volume of his "Handbook" appeared in 1893; the second in 1894; the third in 1895; and from his last letters we learn that he was still working with a will, in spite of his afflictions.

As a botanist, Trimen was a man of great attainments. As a friend, he was sympathetic, sincere, and constant. His work was always thoroughly and conscientiously performed, and is consequently of an enduring nature. This was recognised in his being elected a Fellow of the Royal Society in 1883. W. BOTTING HEMSLEY.

NOTES.

As briefly announced in these columns on September 17, a Nansen research fund is being raised in Norway. Its object is to commemorate the remarkable Arctic expedition of this explorer by the foundation of a fund called "The Fridtjof Nansen Fund" for scientific research. The *Times* of October 23 says it is intended that, by this means, research in various departments of science shall be promoted, and the results published. Dr. Nansen himself may be appointed director, but there will e no salary attached to the office, as the whole of the yearly products of the fund will be devoted to the objects stated. Up to the present no less than 300,000 kroner have been subscribed. Consul A. Herberg, Dr. Nansen's friend, has contributed 50,000 kroner; while others, besides numerous Norwegians, are Baron Oscar Dickson, 25,000 kroner; Dr. A. Nobel, 25,000 kroner; and Prof. Frankland, 1000 kroner. It is stated that the fund will probably be placed under the care of the Christiania University, the Norwegian Society of Science, and the Bergen Museum. If any wealthy Englishmen, who are admirers of Dr. Nansen, care to contribute, they should communicate with the Committee of the "Fridtjof Nansens fond til indenskabens emme, University, Christiania."

FROM the *British Central African Gazette* we learn that Mr. Alexander Whyte, Sir Harry Johnston's scientific assistant in British Central Africa, has just returned from a successful expedition into the Nyika plateau on the north-eastern shores of Lake Nyasa, and has made a large collection. The flora of this district proved to be most interesting, resembling that of Mount Milanji in the south of Nyasaland, but differing from it in many respects. Mr. Whyte failed to find any trace of a conifer, but the range is richer in heaths than Milanji. He obtained 6000 specimens of plants and a large zoological collection.

AT a meeting of the Physical Society, to be held on October 30, it will be proposed (*inter alia*) that the subscription to the Society be increased to £2 2*s.*, that life members be invited to contribute an annual subscription of £1 1*s.*, and that, in future, members be styled "Fellows of the Physical Society of London."

A NOTABLE experiment in kite-flying was made at Blue Hill Observatory, N.J., on October 8. The greatest height yet reached by kites was attained, records being made at a height of 9385 feet above sea-level. More than three miles of piano wire were paid out, the ascension beginning at 9.15 a.m., and continuing till 9.5 p.m. The pull on the wire was from 20 to 50 pounds at the start, and ranged from 50 to 95 pounds at the highest point, after which it slowly decreased. The instrument entered and passed through clouds, as shown by the record of very dry air above them. The temperature fell from 46° at the hill to 20° at an altitude of 8750 feet. The meteorograph record in ink, on a revolving cylinder run by clockwork, was the best yet obtained. The lifting force consisted of seven Eddy, or tailless, and two Hargrave, or box kites, from 6 to 9 feet in diameter. The instrument was more than a mile high during three hours.

THE King of Servia has conferred upon Prof. D. E. Hughes, F.R.S., the Grand Officer's Star and Collar of the Royal Order of Takovo.

MR. J. WOLFE BARRY, C.B., F.R.S., is to deliver his presidential address to the Institution of Civil Engineers on November 3, at the inauguration of the seventy-eighth session of the society.

MR. J. DE WINTER, Assistant at the Royal Zoological Society's Garden at Antwerp, has been appointed Superintendent of the Zoological Garden at Gizeh, Cairo, and will shortly leave for Egypt.

THE first meeting of the British Ornithologists' Club for the present session was held at Frascati's Restaurant, Oxford Street, on Wednesday, the 22nd inst., and was attended by thirty-four members and guests. After some preliminary business Mr. Sclater, who was in the chair, gave an address on the progress of Ornithology during the past twelvemonths.

Various communications and exhibitions followed, amongst which was an account of the occurrence in England of a bird new to the British Avifauna. This was the greenish Willow-warbler, *Phylloscopus viridanus*, Blyth, an inhabitant of North India and Western Asia, which has previously occurred as far west as Heligoland.

MR. J. H. GREATHEAD, the engineer, who wil be chiefly remembered as the pioneer in the system of tunnelling by means of the shield which bears his name, died on Wednesday, October 21.

WE notice with much regret the announcement of the death of Dr. George Harley. Dr. Harley was born on February 12, 1829, at Haddington. At the end of his sixteenth year he matriculated as a medical student at the University of Edinburgh, graduating there in 1850. He left Edinburgh in the following year, and went to Paris to pursue his scientific studies. After two years' residence there he proceeded to Germany, where he continued his studies at the Universities of Würzburg, Berlin, Vienna, and Heidelberg. On his return to England he became Curator of the Anatomical Museum at University College, and subsequently he was appointed to its lectureship on practical physiology and histology. In 1859 he was appointed to the professorship of medical jurisprudence at the College, and shortly afterwards was made physician to University College Hospital. In 1861 he won the triennial prize of fifty guineas, offered by the Royal College of Surgeons, for an essay "On the Anatomy and Physiology of the Supra-Renal Bodies." Up to 1863 he had contributed no fewer than twenty-one separate memoirs to science, which fact was recognised by his election into the Royal Society in 1865. He was already at that time a corresponding member of the Academy of Sciences, of Bavaria, and of the Academy of Medicine, of Madrid. It was Dr. George Harley who proposed what is known as the A.C.E. anæsthetic, a mixture of absolute alcohol, chloroform, and sulphuric ether, in the proportion : 2 : 3. His suggestion was adopted by the Chloroform Committee of the Royal Medico-Chirurgical Society, and soon it became widely accepted as being the safest of any of the known anæsthetics. He was the author of several valuable works on medical subjects.

THE opening of a new Pathological Institute at Glasgow is reported in the *Lancet*. The Institute is an addition to the Western Infirmary, and every care has been taken to ensure its adequacy for its purpose. It comprises a large lecture-room, post-mortem laboratory, practical class-room, chemical and bacteriological laboratories, photographic room, and private working rooms in which origina researches may be conducted, as well as a large and commodious museum. The total expenditure has exceeded £15,000. At the inaugural ceremony Prof. Gairdner delivered an address on the relation of the study of pathology to the art of medicine and the public health. Speeches were also delivered by Prof. Coats, Prof. Boyce (Liverpool), Dr. Leith (Edinburgh), Mr. J. G. A. Baird, M.P., and Mr. J. Wilson, M.P.

THE new session of the Royal Geographica Society will open on November 10 with a brief introductory address by the President, Sir Clements Markham, and a description, by Mr. A. Montefiore Brice, of last year's work of the Jackson-Harmsworth Arctic Expedition. On November 23, Lieut. Vandeleur will give a paper on Uganda, Unyoro, and the Upper Nile Region, and on December 7, Colonel J. K. Trotter will describe his journey to the sources of the Niger. Dr. Fridtjof Nansen will give an account of the results of his recent expedition across the North Polar area, at a meeting to be held towards the end of January. Other papers, which may be expected after Christmas, are the following:—Exploration in Spitzbergen, by Sir W. Martin Conway; a journey through Senegambia, by Harry W. Lake; an expedition to the Barotse country, by Captain A. S. Gibbons and his companions, Percy C. Reid and Captain Bertrand; the cañons of Southern Italy, by R. S. Günther; journeys in Tripoli, by H. S. Cowper; journeys in Central Asia, by Dr. Sven Hedin; exploration on the South of Hudson's Bay, by Dr. Robert Bell. Special meetings will be held in connection with the 400th anniversary of the discovery of Newfoundland by Cabot, and of the Cape route to India by Vasco da Gama. Under the joint auspices of the Society and the London University Extension, Mr. H. J. Mackinder is giving a course of twenty-five lectures on the geography of Europe, Asia and Northern Africa, in illustration of the methods and principles of modern geography, at Gresham College, Basinghall Street, E.C.

SO many popular periodicals now consist entirely of snippets, that the public taste for more substantial literature has been impaired. It is, therefore, with no small degree of satisfaction that we note the counteracting influence of the *Daily Chronicle*. At the beginning of September that journal published a paper by Dr. Nansen on his Arctic expedition, and also a detailed communication from Captain Sverdrup on the voyage of the *Fram*. The enterprise which secured these interesting narratives is again shown by the announcement that the *Daily Chronicle* of November 2, 3, and 4, will contain a signed description by Nansen himself of his recent expedition, accompanied by a map of the course of the *Fram* and of his sledge journey. The narrative will be illustrated by sixteen drawings from photographs. The first part will describe the general plan of the expedition, and the drifting of the *Fram* in the Polar current; the second will deal with the journey of Nansen and Johansen from March 1895 until they met Mr. Jackson; and the third part will be devoted to the voyage of the *Fram* after they left her. The articles will thus epitomise the whole of the results of the expedition; and we are glad that a contribution of this character will appear in a daily paper appealing to such a wide public as that commanded by our very active contemporary.

THE Pasteur Institute of India is now within measurable distance of becoming an accomplished fact. From a report in the Allahabad *Pioneer Mail* of a meeting of the Council, on September 10, we learn that 70,000 rupees has already been collected in subscriptions from the general public, and it is estimated that with 50,000 rupees more the building might be commenced, equipment provided, and work begun at a very early date. In addition to the contributions referred to, annual subscriptions amounting to 2873 rupees have been promised by well-disposed Municipal and District Boards, and from the purses of private individuals in the Punjab, for the maintenance of the institution; and if this sum be added to 1500 rupees, *i.e.* the interest at 3 per cent. on a fund of 50,000 rupees now available for investment, there is already at the disposal of the Body of Control a total annual income of 4373 rupees. The question of a site for the Institute has not yet been settled. The scope of the proposed Institute was described in these columns on September 17 (p. 483).

MR. GOSSELIN, of the British Embassy in Berlin, mentions in a recent report (says the *Times*) that the question of preserving big game in German East Africa has been under the consideration of the local authorities for some time past, and a regulation has been notified at Dar-es-Salaam which it is hoped will do something towards checking the wanton destruction of elephants and other indigenous animals. Under this regulation every hunter must take out an annual licence, for which the fee varies from five to 500 rupees, the former being the ordinary fee for natives, the latter for elephant and rhinoceros hunting and for the members of sporting expeditions into the interior. Licences are not needed for the purpose of obtaining food, nor for shooting game damaging cultivated land, nor for shooting apes, beasts of prey, wild boars, reptiles, and all birds except ostriches and cranes. Whatever the circumstances the shooting is prohibited of all young game—calves, foals, young elephants, either tuskless or having tusks under three kilos, all female game if recognisable—except, of course, those in the above category of unprotected animals. Further, in the Moschi district of Kilima-Njaro, no one, whether possessing a licence or not, is allowed without the special permission of the Governor to shoot antelopes, giraffes, buffaloes, ostriches, and cranes. Further, special permission must be obtained to hunt these with nets, by kindling fires, or by big drives. Those who are not natives have also to pay 100 rupees for the first elephant killed and 250 for each additional one, and 50 rupees for the first rhinoceros and 150 for each succeeding one. Special game preserves are also to be established, and Major von Wissmann, in a circular to the local officers, explains that no shooting whatever will be allowed in these without special permission from the Government. The reserves will be of interest to science as a means of preserving from extirpation the rarer species, and the Governor calls for suggestions as to the best places for them. They are to extend in each direction at least ten hours' journey on foot. He further asks for suggestions as to hippopotamus reserves, where injury would not be done to plantations. Two districts are already notified as game sanctuaries. Major von Wissmann further suggests that the station authorities should endeavour to domesticate zebras (especially when crossed with muscat and other asses and horses), ostriches, and hyæna dogs crossed with European breeds. Mr. Gosselin remarks that the best means of preventing the extermination of elephants would be to fix by international agreement amongst all the Powers on the East African coast a close time for elephants, and to render illegal the exportation or sale of tusks under a certain age.

AN interesting report has been drawn up by Dr. M. C. Schuyten on the influence of atmospheric variations on the voluntary attention of school-children (*Bulletin de l'Académie Royale de Belgique*). Observations were made in four different schools in Belgium, the method adopted being to give the children in class a passage to read from a book, and to note whether their eyes were fixed on the pages. The general conclusions arrived at by statistical tabulation of the results were as follows: (1) The attention of children varies inversely with the temperature of the air, being greater in winter than in summer; (2) it is greater in the higher than in the lower classes; (3) it is higher among girls than boys, and the difference is greatest in winter; (4) it decreases from 8.30 to 11 a.m., and also from 2 to 4 p.m.; at 2 p.m. it is greater than at 11 a.m., but less than at 8.30 a.m.

DR. NANSEN'S work on his expedition to the North Pole will be published in the English language by Messrs. Archibald Constable and Co.

THE Rev. Edmund Ledger will give a course of four lectures upon "Eclipses of the Sun," at Gresham College, Basinghall Street, on November 3, 4, 5, and 6. The lectures are free, and they commence at 6.0 p.m.

THE editor of the *Journal of Malacology* requests us to say that he is still desirous of obtaining living specimens of worm-eating slugs (*Testacellæ*), so as to add to the records he has of the distribution of these animals in the British Isles, and which he hopes to be soon in a position to publish. All communications should be addressed to Wilfred Mark Webb, "Ellerie," Crescent Road, Brentwood, Essex.

DURING November, popular science lectures will be delivered on Tuesday evenings, at 8.30, at the Royal Victoria Hall, Waterloo Road, as follows:—November 3, Rev. J. Grant Mills, on "St. Thomas's Hospital, Past and Present"; November 10, Prof. Carlton J. Lambert, on "A Pennyworth of Gas; what it is, and what we can do with it"; November 17, Dr. Bertram L. Abrahams, on "The Eye"; November 24, Lieut. Darwin, on "A Popular Account of an Astronomical Expedition."

A MEETING of the Institution of Mechanical Engineers will be held on Wednesday and Thursday, November 4 and 5. The chair will be taken at half-past seven p.m. on each evening by the President, Mr. E. Windsor Richards. The following papers will be read and discussed, as far as time permits:—"Research Committee on the Value of the Steam-Jacket; Experiment on a Locomotive Engine," by Prof. T. Hudson Beare and Mr. Bryan Donkin; "Transmission of Heat from Surface Condensation through Metal Cylinders," by Lieut.-Colonel English and Mr. Bryan Donkin; "Breakdowns of Stationary Steam-Engines," by Mr. Michael Longridge.

THE *Kew Bulletin* (Nos. 113 and 114) gives an account of the progress, since its foundation in 1892, of the botanic station at Belize, British Honduras. It has been founded by the Governor, Sir Alfred Moloney, for the purpose of experimenting on the tropical staples most suitable for the climate. Since the decline in the production of mahogany, due to African competition, the export of logwood has been almost the sole source of wealth to the colony. It would appear, however, that British Honduras is very favourably situated, as regards soil and climate, for the production of many other tropical commodities, and has excellent communication with the Southern States of America.

IT has long been known that during the slow oxidation of a number of substances in oxygen or air, part of the oxygen becomes endowed with peculiarly active properties. Various explanations of the phenomenon have been offered; the tendency of recent investigation, however, seems to be to show that the oxygen molecules split up into atoms (probably with opposite electrical charges), one of which brings about oxidation, the other forming the so-called active oxygen. An interesting contribution to our knowledge of this subject is just published in the form of an inaugural dissertation by Mr. W. P. Jorissen (Amsterdam, 1896). He finds that triethyl-phosphine, in presence of water (in the dry state the reaction proceeds further), takes up from the air a quantity of oxygen corresponding to the formation of triethyl phosphine oxide, $P(C_2H_5)_3O$. Benzaldehyde is similarly converted into benzoic acid. If, however, a substance such as a solution of indigo, which is not oxidised by ordinary oxygen, be present, twice as much oxygen is absorbed, the indigo being decolourised. For each atom of oxygen used up in oxidising the triethyl phosphine or benzaldehyde an atom of "active" oxygen is produced, which acts on the indigo. The changes occurring during slow oxidation are, however, frequently more complicated. For example, if a mixture of benzaldehyde and acetic anhydride be exposed to the air, oxidation occurs with formation of benzoyl peroxide and ozone. Jorissen supposes the reaction to proceed as follows.

$$2C_6H_5COH + 2O_2 = 2C_6H_5COOH + 2O \text{ (active)}$$
$$2C_6H_5COOH + O_2 + 2O \text{ (active)} = (C_6H_5CO)_2O_2 + H_2O + O_3.$$

The acetic anhydride serves probably as a dehydrating agent. In conformity with these equations, it is found that twice as much oxygen is absorbed in this reaction as if the benzaldehyde had simply been oxidised to benzoic acid. His own experiments, taken together with previously published results, lead the author to the conclusion that "a body undergoing slow oxidation converts the same quantity of oxygen into the 'active' state, as it itself takes up in the formation of the *primary* product of oxidation."

THE theory of electrolytic dissociation, which is of such great importance in modern chemical speculations, has been hitherto almost exclusively confined, in its application, to aqueous solutions. Notwithstanding the few investigations of the electrical conductivity of solutions of salts in other solvents which have already appeared, our knowledge of the ionisation of such solutions is still very fragmentary. An extensive series of measurements of the conductivity of solutions of salts in methyl alcohol, published by Messrs. Zelinsky and Krapiwin in the current number of the *Zeitschrift für physikalische Chemie*, is therefore very welcome. They find that the methyl alcohol solutions have, in many cases, conductivities of the same order of magnitude as the aqueous solutions. For example, the conductivities of methyl alcoholic and aqueous solutions of potassium bromide of the same strength are in the ratio 1 : 1·5 approximately, with tetramethyl-ammonium bromide the ratio is 1·1, and the dilute alcoholic solutions of trimethylsulphine iodide possess almost the same conductivities as the aqueous solutions. The influence of the change of solvent is more marked with the acids; oxalic and trichloracetic acids, for example, the aqueous solutions of which are good conductors, possess very small conductivities in methyl alcoholic solution. In all cases the molecular conductivity increases with increasing dilution; he limit does not appear, however, to have been reached for any of the substances examined. The molecu ar conductivity of some of the badly conducting substances increases with the dilution in much the same way as is the case with aqueous solutions of feebly dissociated substances, viz. approximately in proportion to the square root of the dilution. For example, the molecule conductivity of a solution of tin diethyl iodide, $Sn(C_2H_5)_2I_2$, increases 1·36 times when the dilution is doubled, i nstead of $\sqrt{2} = 1{\cdot}41$ times; with trichloracetic acid the increase s 1·365 times. A curious fact, no explanation of which is as yet forthcoming, is that the substitution of a sma quantity of alcohol for water diminishes the conductivity of the aqueous solutions considerably, and that the addition of a little water to the alcohol used has the same effect on the alcoholic solutions. Measurements of the conductivities of some salts dissolved in a mixture of equal parts by weight of methyl alcohol and water, show that they are almost exactly half those found in pure water, or 25–30 per cent. smaller than those found in pure methyl alcohol.

THE additions to the Zoological Society's Gardens during the past week include three Purple-faced Monkeys (*Semnopithecu, leucoprymnus*) from Ceylon, a Rhesus Monkey (*Macacus rhesus*), a —— Bamboo Rat (*Rhizomys*, sp. inc.), a —— Mouse (*Mus*, sp. inc), three —— Doves (*Turtur*, sp. inc.), eleven Burmese Tortoises (*Testudo elongata*), seven Black-backed Tortoises (*Testudo platynota*), three Ceylonese Terrapins (*Nicoria trijuga*, var. *edeniana*), four Shielded River Turtles (*Emys scutata*), five Cocteau's Geckos (*Hemidactylus coctæi*), twelve Verticillated Geckos (*Gecko verticillatus*), six Yellowish Monitors (*Varanus flavescens*), six Doria's Lizards (*Mabuia doriæ*), six Emma's Lizards (*Calotes emma*), three Bell's Lizards (*Liolepis belliana*), five Robed Snakes (*Tropidonotus stolatus*), two Fishing Snakes (*Tropidonotus piscator*), a Rayed Snake (*Coluber radiatus*), a Condenar Sand-Snake (*Psammophis condanarus*), two Well-spotted Snakes (*Dipsadomorphus multimaculatus*), two Olivaceus Water-Snakes (*Hypsirhina euhydris*), an Aulic Snake (*Lycodon aulicus*), two Ornamental Tree Snakes (*Chrysopelea ornata*), four Grass-Green Tree Snakes (*Dryophis prosina*). two Long-snouted Snakes (*Passerita mycterizans*), a Hamadryad (*Ophiophagus elaps*), a Banded Bungarus (*Bungarus fasciatus*), an Indian Cobra (*Naia tripudians*), three Russell's Vipers (*Vipera russelli*), eleven Green Pit-Vipers (*Lachesis gramineus*) from Burmah, presented by Mr. W. C. Bligh; a Black Lemur (*Lemur macao*) from Madagascar, presented by Captain H. Talboys; a Black Wallaby (*Halmaturus nalabatus*) from New South Wales, presented by Mr. Malcolm Watson; a Moorish Tortoise (*Testudo mauritanica*) from North Africa, presented by Mr. R. M. C. Souper; a Yellow-cheeked Lemur (*Lemur xanthomystax*) from Madagascar, presented by Mr. H. O. Townshend; a Smith's Dwarf Lemur (*Microcebus smithi*) from Madagascar, presented by Dr. Hubert E. J. Bliss; two Panolia Deer (*Cervus eldi*) from Burmah, deposited; two Virginian Eagle Owls (*Bubo virginianus*) from North America, purchased; a Great Eagle Owl (*Bubo maximus*) European, received in exchange.

OUR ASTRONOMICAL COLUMN.

COMET 1870 II.—This comet was discovered on August 28, by Coggia in Marseilles, and was last observed by Pechüle in Hamburg. During the period of its visibility it described a heliocentric arc of about 59°. On September 26 it approached its least distance from the earth, this being measured as 0·885 radii of the earth's orbit. In appearance the comet resembled a nebular mass with a perceptible nucleus; it varied, however, considerably, sometimes appearing without a nucleus, while at other times several nuclei were observed. Up to the present time the ephemeris obtained from the elements, computed by Gerst, represented very well the observed positions.

These elements were as follows:—

T = 1870 September 2·23393 Berlin Mean Time.

$$\left.\begin{array}{l} \pi = 7^\circ\ 53'\ 19''{\cdot}0 \\ \Omega = 12\ \ 56\ \ 22{\cdot}4 \\ i = 99\ \ 20\ \ 45{\cdot}9 \end{array}\right\}\ 1870{\cdot}0$$

$$\log q = 0{\cdot}259288$$

Dr. Anton Schobloch has, however, undertaken the investigation of determining more thoroughly the elements of this comet. In this calculation he has included 311 observations, made at various observatories. The main figures in the computation will be found in *Astronomische Nachrichten* (No. 3383), together with the list of the observations and comparison stars used. The result shows, however, that there is no reason to depart from the assumption of a parabolic orbit. The final elements, as given below, differ only slightly from those obtained by Gerst. They are, as the following figures show:

Mean Equinox, 1870·0. Osculation, September 13·5, Berlin Mean Time.

T = 1870 September 2·2318232 Berlin Mean Time.

$$\left.\begin{array}{l} \pi = 7^\circ\ 53'\ 15''{\cdot}14 \\ \Omega = 12\ \ 56\ \ 18{\cdot}78 \\ i = 99\ \ 21\ \ \ 3{\cdot}90 \end{array}\right\}\ \text{Ecliptic}$$

$$\log q = 0{\cdot}2592768.$$

COMET GIACOBINI.—This comet is not a very bright object in the heavens, but as Prof. Kreutz appeals for more observations to enable an accurate determination of its period possible, we give the following ephemeris. The elements on which this is based are those obtained by Messrs. Perrotin and Giacobini from observations made on September 4, 12, and 27. A glance at the ephemeris, given in *Astr. Nach.* (No. 3384), shows that the southern declination of the comet commences, about November 3, to decrease.

Ephemeris for 12h. Berlin Mean Time.

1896.		R.A. app. h. m. s.	Decl. app. ° '	log r.	log Δ	Br.
Oct.	29 ...	19 36 26	−13 43·5	0·1616	0·1177	0·97
	30 ...	39 42	44·6			
	31 ...	42 58	45·4			
Nov.	1 ...	46 15	46·0			
	2 ...	49 32	46·3	0·1620	0·1243	0·94
	3 ...	52 50	46·4			
	4 ...	56 8	46·2			
	5 ...	19 59 27	−13 45·7			

PLANETARY NOTES.—In the current number of *Astronomische Nachrichten* (No. 3384), the following information, which was telegraphed by Mr. Percival Lowell to Mr. J. Ritchie, jun., in Boston, is given:—

Oct. 4 Phison and Euphrates, Martian canals are double.

Oct. 5 Mercury and Venus rotate once on their axes in a revolution round the sun. Venus is not cloud covered but veiled in an atmosphere. Mercury is not.

Thus Mr. Lowell favours the view held by Schiaparelli and Perrotin regarding the length of the period of rotation of Venus. It may be remembered that this latter observer made a series of observations only last year to corroborate his previous work. He took up his position on a mountain (Monnier) 2741 metres high, where the atmosphere seemed all that could be desired for his observations. The result of his study was the same as that which he had formerly obtained. The appearance of the planet's terminator at different times suffered no variation, and the western limb, which could be well seen, resembled exactly the eastern as it was observed in 1890. Further, by watching carefully the dark markings at the different periods of time, the phenomenon of libration was noticed, a fact which considerably strengthens the hypothesis of a longer time of rotation than that favoured by several other observers, namely, about twenty-four hours.

At present the weight of evidence seems to favour the hypothesis of the long period, but it cannot be said as yet that the question is finally settled, for opinion is still divided.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

THE formation of an independent section for Physiology and Experimental Pathology has been fully justified by the success of its second meeting at Liverpool. In scientific importance the communications compared favourably with those of Oxford, whilst the number of papers was so large that the business of the Section was with difficulty got through, although the sittings were extended to six days.

The proceedings opened on Thursday with a communication by Prof. McKendrick, on the application of the phonograph to the analysis of sounds. A new method of transcribing the phonographic records was demonstrated; the essential feature of this method consisted in an aluminium lever connected at one end with a special form of syphon recorder, and having the other shaped so as to accurately fit the grooves cut on the phonographic cylinder. A further feature of the transcribing apparatus was obtained by causing the phonographic cylinder to rotate with extreme slowness; by this means the vibrations of the syphon recorder could be transcribed on a continuous slip of paper, such as is employed in telegraphy, travelling at such speed that the phonogram events of 1″ were spread out over a distance of 10 feet on the record. An ingenious arrangement caused the continuous slip of paper to vibrate so as to obviate the necessity of the syphon recorder coming in contact with the paper, and thus diminishing to a minimum any error due to the friction of the writing pen. The transcribed tracings, magnified by the lever, represented the actual cylinder phonograms magnified 500 to 1000 times in amplitude. The tracings showed (1) that many musical instruments give a transcribed form which is absolutely characteristic; (2) that such characteristic form may be detected in very complicated phonograms—for instance, that caused by a band of instruments, including that which, when alone, gives the special form; (3) that when numerous sounds of different pitch follow one another in rapid succession, the ear recognises relative pitch when the transcribed curve shows that the special vibration for this has been repeated only ten times, *i.e.* when the sound has lasted a mere fraction of a second, presumably $\frac{1}{50}$″.

By means of a resonator comprising a microphone contact, the phonographic cylinder was made to produce oscillations which enabled the record to be transformed into variations of current intensity; the apparatus being much the same as that used by Hurthlé for obtaining electrical changes in correspondence with the sounds of the heart. The cylinder was arranged so that when driven slowly it communicated the record of its grooved inscription to a suitable tambour, and thus to the microphonic circuit. The variations in current intensity are, with suitable battery power, easily appreciated when conducted through the moistened hands, and give rise to specific series of sensations which can be appreciated by the deaf; it is thus possible that the rhythm, magnitude, and possibly the specific character of a phonogram may be rendered capable of being understood, apart from the sense of hearing.

Mr. R. J. Lloyd read a critical paper on the production of vowel sounds, and discussed the value of the phonographic evidence at present available for the analysis of such sounds.

Prof. Macallum, of Toronto, gave a short communication on a means of detecting the difference between organic and inorganic salts of iron. An absolutely pure solution of hæmatoxylin is turned bluish-black in the presence of inorganic salts of iron, but is not so affected by organic compounds. If the organic compounds of iron present in any tissue—spleen, liver, &c. —are changed by suitable treatment with acid, so as to produce inorganic iron salts, then the tissue stains very darkly with the hæmatoxylin, and is quite different in appearance to that which is produced by the same dye when no such inorganic salt is present. The views advanced by Bunge as to the introduction of iron into the system by means of organic, in preference to inorganic iron compounds, have resulted in the production of a very large number of so-called organic iron remedial agents. Prof. Macallum showed that a considerable number of these contained large quantities of the inorganic iron salts, which would be detected by the above method. The importance of possessing an easy and effectual means for differentiating between the two sets of iron compounds is by no means confined to the analysis of such remedial agents; a large number of physiological processes are intimately bound up with the transfer or the presence of iron, and the method of determining such an essential character of its chemical relations may be employed in many physiological investigations.

Dr. Marcet read a paper on types of human respiration. After a short introduction describing the graphic method employed in the investigation, the following different types were contrasted: (1) normal automatic breathing; (2) forced breathing; (3) breathing during exercise; (4) breathing whilst under the influence of a strong volitional effort. Forced breathing is characterised by a large increase in the volume of air taken in at each inspiration, its cessation being followed by the well-known pause, *i.e.* apnœa. Breathing during exercise gives tracings which are to be interpreted as indicating a similar increased amplitude in each inspiration; but on cessation of exercise there is no pause, the increased inspiratory effect being maintained, and only slowly returning to the normal. Breathing is influenced by any pronounced volitional effort, even when this effort is not carried out by obvious muscular activity. Thus a strong volitional effort towards a form of movement will cause an increase in the volume of inspired air. This increase may be seen superadded to that caused by actual exercise when both the exercise and the volitional effort are contemporaneous.

On Friday, Profs. Lorrain Smith and Westbrook gave an account of the febrile reaction produced in mice by inoculation with cultures of *Bacillus pyocyaneus*, *B. anthacis*, *murisepticus*, &c. Although these animals react to the inoculation, the febrile condition presents several remarkable characteristics as regards metabolism; thus the variations in respiratory interchange were not so marked as those due to food, or to alterations in the temperature of the surroundings in the normal animal. Similarly the elimination of nitrogen was not increased to the extent to which it was by food, although in mice the normal nitrogenous balance is one in which the diurnal intake and output is for the body weight extremely large. The febrile reaction in these animals appears not to be associated with a large increase in general metabolism; and this fact demonstrates the necessity for careful study of the conditions under which it occurs in separate groups of animals.

Prof. Thompson (Belfast) followed with a paper on the physiological effects of peptone when injected into the venous system. The injection of Witte's peptone dissolved in physiological sodium chloride solution produces well-known effects, the most prominent being the alteration in the coagulability of the blood and a vascular dilatation, causing a fall of blood pressure. The present investigation brought out some further points as to the production of these phenomena, which may be summarised as follows. (1) In doses over two centigrammes per kilo of body weight the peptone retards the susceptibility of blood to coagulation, but in weaker doses it actually favours such susceptibility; (2) even very small doses of ten milligrammes per kilo, if rapidly injected, can cause a fall of blood pressure; (3) the fall of blood pressure is due to the peripheral effect of the substance upon the blood-vessels, and not to any interference with the central nervous system; (4) the vascular dilatation producing the fall is not confined to the splanchnic area; (5) the dilatation is brought about by lowering the excitability of the peripheral neuro-muscular mechanism of the arterioles; (6) this diminished excitability is in all probability chiefly limited to the nervous part of the above mechanism.

The experiments from which the above conclusions were deduced were carried out in the Sorbonne Laboratory, Paris, and consisted of observations of blood pressure under various conditions, such as section of the spinal cord, excitation of the cord after section, section of the splanchnic nerves, and excitation of the peripheral ends of these, and of the cord after their section. Facsimile photographic reproductions of the tracings were exhibited in support of the above statements.

A paper was read, by Dr. J. L. Bunch, on the nerves of the intestine, and the effects upon these of small doses of nicotine. The method of study was one in which a small portion of the intestine was suitably exposed and connected so as to record its movements. The following facts were brought out and illustrated by photographs of the tracings. (1) The stimulation of the peripheral end of the cut vagus nerve causes no motor effect as regards the portions of small intestine investigated. This is so not only with small doses of atropine to eliminate cardiac inhibition, but when the nerve is excited low down in the absence of atropine. (2) The excitation of the peripheral end of the cut splanchnic nerves may cause either contraction or dilatation of the portion of intestine, but does not produce simple inhibition of its movements.

These two facts thus seem to show, in opposition to the views previously held, that the vagus fibres play no part in the production of intestinal movements, and that the splanchnics contain augmentor and depressor fibres for the intestinal neuro-muscular mechanism.

Further researches as to the splanchnic fibres showed (*a*) that the nerve roots, the stimulation of which produce the splanchnic effects, are pre-eminently those between the eighth and thirteenth post-cervical nerves; (*b*) that the intravenous injection of small doses of nicotine can abolish the excitatory effects evoked by stimulation of the nerve roots, although effects may still be produced by excitation of the trunk of the splanchnic nerves; hence the nerve-cell station appears to be in the sympathetic ganglia.

Dr. Grünbaum followed with a communication on the effect of peritonitis on peristalsis. The peritonitis was produced by the injection of turpentine or other substances into the peritoneal cavity. The peristalsis was observed through the shaved abdominal wall, and in the opened cavity immersed in physiological salt solution at the body temperature. The peristalsis of both large and small intestine was increased for twenty-four hours after the injection; it then gradually diminished, and in four days resulted in complete paralysis, the large intestine being paralysed before the small intestine.

Dr. Pavy gave a communication on the glucoside constitution of proteid. He drew attention to the universal recognition of the importance of the glucoside in the vegetable kingdom, and to the fact that such bodies as salicin and amygdalin were known to admit of cleavage into nitrogenous and glucoside moieties. In the animal kingdom the mucin-like substance of bile admitted of a similar cleavage. In 1894 the author published a method for demonstrating a similar cleavage of proteid. This consisted in dissolving a tissue in potash, precipitating by alcohol, and treating the precipitate with sulphuric acid. The glucose produced, varied in amount according to the duration of the previous treatment with potash and the strength of the reagent, hence it could not be due to the conversion of the glycogen of the tissue by the acid; thus the action of potash is to split off from the proteid an amylose carbohydrate corresponding with the animal gum of Landwehr, which is converted by sulphuric acid into glucose. Dr. Pavy further stated his belief that a similar proteid cleavage may occur in the animal body resulting in the formation of glycogen, and thus of glucose, and that it is the excess of this disintegration which is the essential feature of diabetes; whilst if in the process of digestion a cleavage of similar character occurs, this fact must be one of extreme therapeutic importance in connection with the views held as to the dietetic treatment of diabetes.

Prof. Gotch communicated the results of experiments carried out by Mr. Burch and himself, which determined the time relations of the activity of a single nerve cell. The response of the electrical organ of *Malapterurus electricus* was shown to be the excitatory change in the nerve endings of the single axis cylinder which supplies it; the reflex response thus gives deductions as to the discharge of the single nerve cell from which this springs. The minimal central delay was found to be ·008″ to ·01″, of which time ·006 must be considered as delayed propagation in the central fine dendrites of both afferent fibre and efferent cell. The central rhythm is one which is very varied, but the extreme limit of frequency was shown to be twelve per second, and the average rate four per second; in all cases this rate was maintained for an extremely short period, each group of discharges comprising only from two to six members. The contrast between the reflex discharge in *Malapterurus* with its one nerve cell was contrasted with that of *Torpedo*, in which the very large number of cells is associated with a rapid central rhythm of from 30 to 100 per second.

On Saturday Prof. Minot (Harvard) showed a new form of microtome, prefacing the demonstration by remarks on the principles of microtome construction.

The new microtome could be adapted to cut either paraffin or celloidin sections, and its construction ensured precision by avoiding the following sources of error: (*a*) the bending of the knife, which is very heavy, of the chisel type, and securely clamped at both ends; (*b*) the yielding of the object to be cut, which is fixed on a wide supporting carrier; (*c*) the jumping of the sliding gear of the carrier; to effect this, the knife being immovable, the carrier gear is rendered as perfect as possible, and allows of displacement only in the direction of its slide, and the object secured upon the carriage by very rigid fastenings.

Additional advantages are secured by a simple accurate method of raising the object, a known amount, at each slide, and by a device for removing the alcohol moistening the knife and object so that it shall not fall upon the working gear.

The microtome has been placed on the market by Messrs. Bausch and Lamb of Rochester, New York; its probable cost being from twelve to fifteen pounds.

Prof. Waller gave a communication, illustrated by a large number of facsimile photographs, as to the conditions which modify the electrical response of an isolated nerve to stimulation.

The method of investigation was described: it consisted in stimulating the isolated nerve by a rapid series of induced currents for a very brief period, this stimulation being repeated at regular intervals; the electrical response thus evoked was indicated by means of a galvanometer suitably connected with the nerve, and arranged so that the deflections of the galvanometer needle should be photographed on a slowly moving plate. The nerve is practically submitted to a question-and-answer at regular short intervals, the question being constant, and the answer varying with the state of the nerve. Various chemical reagents alter the character of the response; and nerve records were exhibited showing (1) that chloroform is more toxic than ether; (2) that carbon dioxide is typically anæsthetic; (3) that nitrous oxide is inert; (4) that the basic is more effective than the acid moiety of such neutral salts as KBr, NaBr, and KCl; (5) that the response is modified by the action of various alkaloids, such as morphine, atropine, aconitine, veratrine, curarine, and digitaline.

Dr. Mann exhibited wax models of nerve-cells magnified one thousand times, and made from serial sections taken through the cell in different planes. The models showed the following points, in connection with the structure of the special cells thus portrayed. (1) The unipolar cells of spinal ganglia and multipolar cells of sympathetic ganglia are spherical or oval in the central parts of the ganglion, and flattened parallel to the surface at the periphery of the ganglion. (2) The distal process of the bipolar cells from the spinal ganglion of the guinea-pig is thinner than the proximal process. (3) The cells from Clarke's Column are frequently essentially bipolar, *i.e.* one axis cylinder passes upwards and another downwards, while the dendritic processes are comparatively very few and insignificant. (4) The motor cells in the spinal cord have wing-like processes. (5) In *Malapterurus* the cell body appears much broken up, because of the great development of the dendritic processes. Fritsch's idea of a "Bodenplatte," from which the axis cylinder is supposed to spring, is erroneous.

Dr. Buchanan exhibited a number of microphotographs illustrating cell granulations under normal and abnormal conditions. The evidence afforded by their study appeared to show that the granules of leucocytes are of definite formation, and are in no way analogous to secretion granules, and that whilst leucocytes, under normal conditions, may be classified by the micro-chemical reaction of their granules into oxyphile and basophile groups, the distinction breaks down under abnormal conditions, since many leucocytes are then found exhibiting both oxyphile and basophile granulations at the same time.

Prof. Paul gave a demonstration of microphotographs illustrating some points in dental histology. The chief interest of the work was in regard to the formation of enamel. Whereas the dentine is regarded as a calcification of the intercellular matrix, the enamel is to be regarded as a calcification of cells, and thus tubular enamel is a negative picture of tubular dentine. Nasmyth's membrane was shown to be epithelial in structure, a fact admitting of easy demonstration after rapid decalcification by the phloro-glucin and nitric acid method; it was a remnant of the external layer of enamel epithelium.

Dr. E. Stevenson read a paper on the effect produced upon the eye movements by the destruction of the ear. The experiments were carried out in the dog, an interval elapsing between the lesion of the two sides. The destruction of the right ear caused impairment in the right eye movements, that of both a similar but more marked impairment of both eyes. The effect was great external strabismus, and the movements carried out by the muscles supplied by the third nerve showed a loss of power in these amounting to 75 per cent.

On Monday the President, Dr. Gaskell, gave his address on the origin of Vertebrates, the Section meeting in conjunction with that of Biology. At the President's request the address formed the basis for a discussion, in which several prominent biologists took part.

On Tuesday Prof. Haycraft gave an account of an investigation into photometry by means of the flicker method. The essential feature of this consists of a rotating disc with black and coloured segments, and the disappearance of flickering at any given speed of rotation is taken as the measurable point of luminosity. He also discussed Purkinjé's phenomenon, and showed experiments which proved that one essential factor in its production had been disregarded in previous work upon the subject, this being the persistent psycho-retinal effect of light surroundings; by placing the observer in a dark surrounding, the production of the phenomena is profoundly modified.

Prof. Allen read a paper on the physical basis of life, in which he advanced the following views. The vital phenomena are essentially related to change in the N atoms of nitrogenous compounds; they are accompanied by transfer of O, but this transfer is only brought about by the nitrogen; the nitrogen in the living molecule may be regarded as centrally situated, and in the pentad state; on death it is peripherally situated, and in the triad state.

Dr. Lazarus Barlow described the recent extension of his work upon osmosis, and particularly upon the rate at which this begins and is developed. The resultant initial osmotic pressure was shown to be one which, as produced by different substances, does not run parallel with the final osmotic pressures. Since in physiological processes such final osmotic pressures are out of the question, the initial effects are those which must be taken into account in the determination of such questions as the passage of substances through the living cells. A number of experiments, in which the thoracic outflow of lymph was determined before and after a rapid lowering of the specific gravity of the blood through bleeding, &c., showed no initial check in the rate of flow. The discrepancy between the initial effects produced by osmosis and those observed in the body, appeared to lead to the conclusion that osmosis plays but a small part in either the absorption of substances into the blood, or their outflow from this into the lymph channels.

Dr. Kanthack read a paper on the bacteria in food, in which he criticised the method of bacteriotogical analysis as applied to the determination of suspected food. The number of micro-organisms present in food obtained from very different sources was found to be practically the same, hence the quantitative method is valueless. As regards the qualitative method, the presence of *Bacterium coli* and of Proteus forms cannot be considered as conclusive evidence of fœcal or sewage contamination, since these two forms are apparently ubiquitous, and may be found in almost all food.

Dr. Sims Woodhead called attention to the desirability of the organisation of bacteriological research in connection with public health. He referred to the results obtained by the co-operation of public bodies with those directly concerned in the creation and management of scientific institutions. In London, the Metropolitan Asylums Board has approached the Laboratories of the Colleges of Surgeons and Physicians; in Manchester and Liverpool, the Public Health Committees have made arrangements with the Pathological Departments of Owens and of University College. The results have been of great utility to both sides, and these are examples of what can be achieved by spasmodic efforts. Could this co-operation be systematised and extended, the possibilities of benefit to the community would be enormous. The rapid investigation of matters immediately affecting public health would be the gain of the public, whilst the better equipment, and, above all, adequate maintenance of skilled scientific investigators, through the financial help of public bodies, would be the gain of science.

On Wednesday Dr. Hill, Master of Downing College, read a paper on the minute structure of the cerebellum, in which, among other points of interest, he brought forward evidence in favour of the view that the processes of the Purkinjé nerve cells could be traced into direct continuity with the peripheral arborisations of nerve fibres entering the grey substance from below.

Prof. Fokker read a paper on the basis of the bacteriological theory founded upon observations upon the fermentation of milk.

Dr. Copeman gave an account of experiments as to the action of glycerine upon the growth of bacteria. In this important communication the results of further experiments on the bacteriology of small-pox and vaccinia were brought forward, and thus the question of the purification and preservation of vaccine lymph was discussed. It was shown that whereas ordinary lymph is apt to contain numerous micro-organisms, no visible development of these takes place in lymph treated with 30 per cent. of glycerine. When a mixture of peptone broth and glycerine is inoculated with such organisms as *Streptococcus pyogenes*, *Staphylococcus pyogenes*, *aureus*, and *albus*, *Bacillus pyocyaneus*, *subtilis*, *Coli communis*, *diphtheriæ*, and *tuberculosis*, the microbes are all killed in less than a month by 30 to 40 per cent. of glycerine with the exception of *B. coli communis* and *subtilis*. *Bacillus coli communis*, unlike *B. typhosus*, resists the action of even 50 per cent. of glycerine for a considerable time in the cold, and this property may serve to differentiate between these varieties. Dr. Copeman's discovery that the monkey is susceptible to vaccination, has enabled him to ascertain that small-pox and vaccine material retain their efficacy when completely sterilised for extraneous microbes by the action of 40 per cent. glycerine. He has succeeded in obtaining cultures from such sterilised vaccine, and considers that the single small bacillus present in these may not improbably be the micro-organism of vaccinia.

Dr. Copeman was heartily congratulated by Sir Joseph Lister and Prof. Burdon-Sanderson on the important contribution he had made to preventive medicine.

Dr. Durham read a paper on some points in the mechanism of the reaction to peritoneal infections. He first referred to the work done by himself in conjunction with Prof. Grüber of Vienna, in relation to the alleged paucity of the hyaline and coarsely granular oxyphil leucocytes in the peritoneal liquid, the so-called leucopenia of Löwit. This paucity has been attributed to their destruction due, according to Metschnikoff, to the increased bactericidal power of the peritoneal fluid. The researches carried out at Vienna, and now described, showed that a large deposit of hyaline and the oxyphil cells is found deposited on the omentum, probably through the exceptionally active peristalsis which accompanies the early stages of peritonitis: with these are mixed the bacteria which were used for the local infection; and when these are of low virulence, they are ingested by the hyaline cells quite independent of any previous action of oxyphil cells. The passing away of the state of leucopenia is associated with the presence, in abnormal amount, of a polynuclear leucocyte or finely granular oxyphil cell.

The above is not the sole factor in the production of leucopenia; a second one of great importance was shown to be the flow of lymph along the lymphatics in connection with the peritoneal cavity. Both bacteria and cells are carried in great numbers along these channels.

The coarsely granular or megoxyphil cells are thus never abundant in the peritoneal cavity as free cells; on the other hand, the finely granular or microxyphil cells rapidly increase in number, especially during recovery from local infection, and synchronously with their presence the peritoneal liquid increases in bactericidal power.

Prof. Boyce brought forward the combined report of Prof.

Herdman and himself as to the bacteriology of the oyster. The research dealt with the following points :—

(1) The identification and differentiation of *Bacillus typhosus* and *B. coli communis*. This was determined by the difference (*a*) in fermentation ; (*b*) indol production ; (*c*) milk changes ; (*d*) character of growth in potassic iodide potato gelatine ; (*e*) behaviour in gelatine ; (*f*) motility.

(2) The action of sea-water upon the growth of *B. typhosus*. There is no evidence of their multiplication, but the microbe can be detected under laboratory conditions for fourteen days after infection of the water.

(3) The bacteria present in the alimentary canal of the oyster. In cultures kept at 37° C. the microbes were almost entirely *B. coli*, and varieties of Proteus ; but the deduction that the presence of these indicates sewage contamination could not, in the opinion of the authors, be made without special further research. The fresh oyster contains comparatively few bacteria and a small percentage of *B. coli*.

(4) The infection of the oyster with *Bacillus typhosus*. The research showed that this organism did not multiply in the oyster tissues even when these were thus infected ; it further showed that on subjecting such infected oysters to a running stream of pure, clean sea-water, there was a complete disappearance of *B. typhosus* in from one to seven days.

Dr. Kohn added a chemical report upon the presence of iron and copper in the white and green varieties of oyster. It has been stated that the green colour of the gills of Marennes oysters is associated with an excess of iron in these. The author used an electrolytic method of analysis which, by decomposing the organic material, enables the minute quantities of metal present to be determined with considerable accuracy. The results showed that there was no excess of iron in the gills of green as compared with white oysters. Copper was found to be present in both the green and white varieties, but the slight excess in the gills of the former variety appears to be insufficient to account for their colour ; a conclusion which is confirmed by Prof. Herdman's experiments as to the production of the green colour in oysters grown in very dilute saline solutions of iron salts.

Dr. Abram and Mr. Marsden read a paper on the detection of lead in organic fluids. The method employed consisted in a modification of that of von Jaksch. The fluid is mixed with ammonium oxalate in the proportion of 1 grm. to 150 cc. of fluid, and a strip of magnesium free from lead is immersed for twenty-four hours. The magnesium strip is discoloured if lead is present, and the following confirmatory tests may be applied : (*a*) warm strip with crystal of I, forming iodide of lead ; (*b*) dissolve with HCl, and treat solution with sulphuretted hydrogen. The method is at bottom an electrolytic one, and gives results when lead is present in either water or urine in the proportion of 1 in 50,000. It is simple, and is applicable to all forms of organic fluid in which lead is suspected to exist.

CONFERENCE OF DELEGATES OF THE CORRESPONDING SOCIETIES.

THE first meeting of the Conference took place on September 17 ; Dr. Garson was in the chair.

The proceedings began with the reading of a short paper by Mr. George Abbott, general secretary of the South-Eastern Union of Scientific Societies. In this paper Mr. Abbott remarked that while local Natural History Societies had done much good work, yet that in many cases their efforts had been weak, irregular and desultory, the chief cause of failure having been, in his opinion, want of organisation. He thought that a step in the right direction had been taken by the Unions of Scientific Societies already existing, such as those of Yorkshire and the East of Scotland, but considered that the British Association did not sufficiently foster such unions, and that some plan was necessary to organise the local societies under the guidance of the Association, which should, through an organising secretary, help to bring these unions into being. He submitted the following plan for consideration :—

Districts.—The United Kingdom should be divided into fifteen or twenty districts, in each of which all Natural History Societies should be affiliated for mutual aid, counsel, and work. Existing unions should perhaps be imitated, at any rate not disurbed

Geographical lines should decide their size, which might vary in extent and be dependent, in some measure, on railway facilities. From time to time these areas might be subject to review, and necessary changes made.

Congress.—Each of such unions would have its annual congress attended by delegates and members from its affiliated societies. This would be held in a fresh town every year, with a new president, somewhat after the manner of the British Association itself. The congresses would probably take place in spring, but two should never be held on the same day.

These unions would render important help to local societies, would bring isolated workers together, assist schools, colleges, and technical institutes and museums, start new societies, and revive waning ones. Through these annual meetings local and petty jealousies would lessen or turn to friendly rivalries—each society trying to excel in real work, activity, and good science teaching.

Further, economy of labour would be accomplished by a precise demarcation of area for each local society. This would be understood as its sphere of work and influence ; in this portion of country it would have a certain amount of responsibility in such matters as observation, research, and vigilance against encroachments on footpaths, commons, and wayside wastes.

These unions might also, through their Central Committees, bring about desirable improvements in publication, but it would perhaps not be desirable, in all cases, to go in for joint publication. In this, as in other matters connected with the unions, *co-operation and not uniformity* must be our aim.

Union Committees.—Each union would need a general secretary and a committee, all of whom should be intimately acquainted with methods of work and the best ambitions of local societies,

Corresponding Members.—This is another necessary development. Each local society should appoint in every village in its district a corresponding member with some distinctive title, and certain privileges and advantages.

The work asked of him would be to :

(1) Forward surplus natural history specimens to their Society's museum.

(2) Supply prompt information on the following subjects :—

(*a*) New geological sections.

(*b*) Details of wells, borings, springs, &c.

(*c*) Finds of geological and antiquarian interest.

(3) Answer such questions as the British Association or the local society may require.

(4) Keep an eye on historic buildings.

(5) Assist the Selborne Society in carrying out its objects.

In return he should be offered

(1) Assistance in naming specimens, and with the formation of school museums.

(2) Free admission to lectures and excursions.

(3) Copies of Transactions.

(4) Free use of the Society's library.

Mr. Abbott concluded with some remarks on the cost of these Unions. They would be maintained by means of small contributions from the affiliated societies. He did not attempt to estimate the expense of an organising secretary, but thought that, whatever it might be, the British Association would soon find itself amply repaid in the greatly increased efficiency of the local societies.

The Chairman (Dr. Garson) having invited discussion—

The Rev. E. P. Knubley gave the results of his experience of the Yorkshire Naturalists Union during the twenty years of its existence. It was, he believed, the largest in the country, having 500 members and 2500 associates. It had thirty-six affiliated associations. Their work came under five sections, those of geology, botany, zoology, conchology and entomology. In addition they had research committees ; such as a Boulder Committee, a Sea Coast Erosion Committee, and others. An annual meeting was held in one of the Yorkshire towns. Every effort was made to get each member to do some special work.

Mr. M. H. Mills then gave some account of the Federated Institution of Mining Engineers. Each of the societies composing it did its work independently, as before the existence of the Federation. The one difference was that there was now a single publication instead of many.

Mr. Montagu Browne described the constitution of the Leicester Literary and Philosophical Society. As to payments for printing, each section was usually self-supporting ; but in the case of unusually expensive papers, the parent society made a special grant, if necessary.

Mr. De Rance approved of Mr. Abbott's plan, and felt that without an organising secretary nothing in the way of federation would ever be accomplished.

Mr. W. T. Hindmarsh said, that while the Berwickshire Naturalists' Club had a large field of work, there was no other naturalists' club in it with which they could unite, though their boundaries included not only Berwickshire, but Northumberland outside Newcastle.

Prof. Merivale thought that it would be an excellent thing if the Naturalists' Societies could unite as the societies composing the Federated Institution of Mining Engineers had done.

Prof. Johnson said that they had a good example of a Union in Ireland. It comprised four clubs, one in Dublin, another in Belfast, a third in Cork, and a fourth in Limerick. These had one publication, which was common property, *The Irish Naturalist*.

Mr. Eli Sowerbutts felt that, while federation must generally commend itself to all, there were many delicate questions involved in it which made it difficult to come to a decision at that meeting.

After some discussion, it was decided that Mr. Montagu Browne, Prof. Johnson, the Rev. E. P. Knubley, Mr. Hindmarsh, Mr. W. W. Watts, Mr. O. W. Jeffs, the Rev. T. R. R. Stebbing, and Mr. G. Abbott should form a sub-committee to consider Mr. Abbott's propositions, and report to the Corresponding Societies Committee.

MEETING OF THE SUB-COMMITTEE.

A meeting of the Sub-committee was held on Monday, September 21; the Rev. T. R. R. Stebbing in the chair. The following resolutions were agreed to:—

(1) That Mr. G. Abbott's paper on District Unions of Natural History Societies be distributed by the Committee of Delegates of the Corresponding Societies amongst *all* the Natural History Societies in the United Kingdom, with the request that their opinion on the feasibility of the plan advocated in the paper be communicated as early as possible to the Corresponding Societies Committee for its report to the next conference of delegates.

(2) That the formation of District Unions of Natural History Societies is highly desirable, and would be of general advantage.

(3) That the Committee of Delegates of Corresponding Societies be requested to take steps to encourage the formation of District Unions of Natural History Societies.

(4) That it should be distinctly understood that the formation of Unions would not in any way prevent the affiliation of individual Societies of such Unions to the British Association as at present.

The second Conference took place on September 22; Dr. Garson in the chair.

After some discussion, the report of the Sub-committee for the further consideration of Mr. Abbott's paper was received and adopted.[1]

The Chairman then called upon Prof. Flinders Petrie to read a short paper "On a Federal Staff for Local Museums."

The suggestions only affect a distribution of labour, and will rather economise than require extra expenditure.

In all local museums the main difficulty of the management is that there is neither money nor work enough for a highly trained and competent man. It is in any case impossible to get a universal genius who can deal with every class of object equally well, and hardly any local museum can afford to pay for a first-class curator on any one subject. These difficulties are entirely the result of a want of co-operation.

According to the report of the Committee in 1887, there are fifty-six first class, fifty-five second class, sixty-three third class, and thirty fourth class museums in the kingdom. Setting aside the last two classes as mostly too poor to pay except for mere caretaking, there are 111 in the other classes; and deducting a few of the first class museums as being fully provided, there are 100 museums, all of which endeavour to keep up to the mark by spending, perhaps, 30*l.* to 200*l.* a year on a curator.

The practical course would seem to be their union, in providing a federal staff, to circulate for all purposes requiring skilled knowledge; leaving the permanent attention to each place to devolve on a mere caretaker. If half of these first and second class museums combined in paying 30*l.* a year each, there would be enough to pay three first-rate men 500*l.* a year apiece, and each museum would have a week of attention in the year from a geologist, and the same from a zoologist and an archæologist.

The duties of such a staff would be to arrange and label the new specimens acquired in the past year, taking sometimes a day, or perhaps a fortnight, at one place; to advise on alterations and improvements; to recommend purchases required to fill up gaps; to note duplicates and promote exchanges between museums; and to deliver a lecture on the principal novelties of their own subject in the past year. Such visitants, if well selected, would probably be welcome guests at the houses of some of those interested in the museum in each place.

The effect at the country museums would be that three times in the year a visitant would arrive for one of the three sections, would work everything up to date, stir the local interests by advice and a lecture, stimulate the caretaker, and arrange routine work that could be carried out before the next year's visit, and yet would not cost more than having down three lecturers for the local institution or society, apart from this work.

To many, perhaps most, museums 30*l.* for skilled work, and 30*l.* or 40*l.* for a caretaker, would be an economy on their present expenditure, while they would get far better attention. Such a system could not be suddenly started; but if there were an official base for it, curators could interchange work according to their specialities, and as each museum post fell vacant it might be placed in commission among the best curators in that district, until by gradual selection the most competent men were attached to forty or fifty museums to be served in rotation. It is not impossible that the highest class of the local museums might be glad to subscribe, so as to get special attention on subjects outside of the studies of the present curators.

The Chairman having thanked Prof. Petrie and invited discussion—

Mr. W. E. Hoyle hoped that no action would be taken in this matter in such a way as to prevent co-operation with the Museums Association. Prof. Petrie's scheme seemed to him a most simple and practical one, and he hoped that those interested would confer with the officials of the Museums Association with regard to it. He thought the chief difficulty in carrying it out was the almost incredible inertia of Museum Committees.

Mr. M. H. Mills testified to the thoroughness with which such questions were discussed at meetings of the Museums Association.

Mr. G. Abbott supported Prof. Petrie's suggestions; and Mr. Richardson approved them, but thought the Committee of the Dorset County Museum was hardly in a position to incur the expense.

Prof. Johnson thought it would be a good thing if the Museums Association could become a Corresponding Society of the British Association, so that one or more of its chief officials could always be present at discussions of this kind. He would protest strongly against the suggestion that the curators of our museums should be converted into mere caretakers, as he thought the tendency should be of an opposite kind. He thought it would be better that our local societies should make a specialist of some kind their curator, and give him a chance of rising above the position he held at first.

Prof. Carr regretted that Prof. Petrie's paper had not been read before the Museums Association. Some time ago a sub-committee had been appointed by that Association to report upon a scheme resembling that of Prof. Petrie, but no definite result had been attained. Possibly if Prof. Petrie were now to bring this paper before the Museums Association, more important effects would be produced.

Prof. Petrie, in reply, said that this was to a great extent a money question. He did not, however, think that his suggestions necessarily involved additional expense. He thought that it was better that the money should be divided between the mere caretakers and the specialists, rather than that an attempt should be made to combine them by employing a man who could not be a specialist on all points. Indeed the curators, who were more than mere caretakers, would, through his plan, receive more than before, as they would be able to render service at a number of places, instead of being confined to one.

A vote of thanks to Prof. Petrie having been passed, the Chairman invited remarks from the representatives of the various Sections.

[1] In connection with this subject, it may be useful to remind the reader of Prof. Meldola's paper on "The Work of Local Societies" (NATURE, vol. liv. p. 114, June 4, 1896).

Section C.

Mr. W. Watts invited the co-operation of the Corresponding Societies in the work of the Geological Photographs Committee and the Erratic Blocks Committee.

Mr. De Rance remarked that though the labours of the Underground Waters Committee had come to an end, he hoped the local societies would record carefully in their districts everything bearing upon that subject.

Section H.

Mr. Sidney Hartland asked for the co-operation of the Corresponding Societies in the work of the Ethnographical Survey Committee. Considerable progress had been made in the past year. There were no departments in which it was so important to have speedy information as those of dialect and folk-lore, as education, facilities for railway travelling, and industrial migrations were rapidly destroying local customs, dialects and traditions. Still, in some parts there had been little change, and if physical measurements were made and physical characteristics noted, in stationary districts, of persons belonging to the old families of the locality, much light might be thrown on the various races of the British Isles. He would be glad to furnish any delegates interested in the subject with copies of the Ethnographical Committee's schedules, or with any other help in his power.

Mr. John Gray (Buchan Field Club) described the work done in his district in noting the physical characteristics both of adults and of school children.

The Chairman remarked that Mr. Gray's society was doing very good work, and giving an illustration of what was required. As the information asked for by the Ethnographic Committee was of so many different kinds, he thought the local societies would be wise to form sub-committees, one dealing with physical measurements and characteristics, another with folk-lore, and so on. Then photographers were needed to illustrate both people and ancient monuments. Investigations of this kind would at once enrich the *Transactions* of a local society, and help the work of the British Association.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Cambridge.—The Walsingham Gold Medal for an essay or monograph on a botanical, geological, or zoological subject will be awarded next year. Competitors must be under the standing of M.A., and must send their essays to Prof. Newton, F.R.S., not later than October 9, 1897.

The General Board proposes to fix the stipend of the vacant Professorship of Surgery at £300, but hopes that after 1898 the state of the University finances may make it possible to raise this sum to £500 a year, tenable with a fellowship.

About 135 of the freshmen admitted this term propose to study natural science and medicine with a view to the B.A. and M.B. degrees.

Dr. Allbutt, F.R.S., is appointed an Elector to the chair of Pathology, and Dr. Hill to the chair of Anatomy, in the room of the late Sir G. M. Humphry.

The Examiners for the Natural Sciences Tripos 1897 are—W. N. Shaw, F.R.S., R. Meldola, F.R.S., Dr. A. Scott, A. Hutchinson, H. Woods, J. J. H. Teale, F.R.S., Dr. H. M. Ward, F.R.S., H. Wager, S. F. Harmer, F. Jeffrey Bell, F.R.S., A. C. Seward, J. J. Lister, Prof. A. M. Paterson, Dr. A. Hill, Dr. L. E. Shore, and Prof. W. D. Halliburton.

At the celebration of the 150th anniversary of Princeton University, on October 22, the degree of LL.D. was conferred upon Lord Kelvin and Prof. J. J. Thomson.

It is announced in *Science* that a laboratory built for the Massachusetts General Hospital, Boston, at a cost of over £4000, will soon be ready for use. The building includes well-fitted laboratories of chemistry, bacteriology and histology. It is hoped that an additional sum of £20,000 will be collected for an endowment.

Dr. Thos. Ewan, Chief Assistant in the Chemical Department of the Northern Polytechnic Institute, has been appointed Research Chemist to the British Aluminium Company in their works at Oldbury. He is succeeded at the Northern Polytechnic by Mr. H. Charles L. Bloxam, at present Chief Assistant in the Chemical Department of the Goldsmiths' Institute, New Cross.

The following Scholarships have been awarded in connection with the present session (1896-7) of the Central Technical College:—Clothworkers' Scholarship, £60 a year with free education for two years, L. P. Wilson; Mitchell Scholarship, £40 a year with free education for two years, R. S. Potter; Clothworkers' Technical Scholarship, £30 a year with free education for two years, E. W. Cook; David Salomons Scholarship, £50, E. W. Marchant; John Samuel Scholarship, £30, H. W. Hanbury; Institute's Scholarships, free education for three years, F. S. Miller, J. I. Hunter, F. W. Fawdry.

A general meeting of the members of the Convocation of the University of London was held on Tuesday. After a long discussion it was resolved:—"That this House earnestly desires the early establishment, in accordance with the expressed intentions of the founders of this University, of University professorships and lectureships in science and literature, together with such institutions as may tend to the encouragement of original study and research on the part of members of the University." It was further decided, on the motion of Mr. W. T. Lynn—"That it is desirable to make application to the Government for the provision of funds to establish a students' observatory in the neighbourhood of London for the instruction, primarily, of members of the University in practical astronomy, with the ultimate view of taking part in the progress of astronomical investigation."

So much money is being frittered away by Technical Education Committees as grants for instruction in such subjects as basket-making and hedging, that no apology is needed for again calling attention to the courses of science lectures which the Councils of University and King's Colleges, London, have arranged in conjunction with the Technical Education Board, to be held in the evenings and on Saturday mornings. These lectures are of a university type, being of the same standard as those which are given in the day-time. They are intended for those students who, being occupied in the day, are unable to obtain university instruction except in the evening; and they are given at considerably reduced fees. Among these courses may be mentioned: (1) An evening course on Advanced Chemistry, at University College, by Mr. C. F. Cross. The course will consist of fifteen lectures, given on Friday evenings, commencing on Friday, November 6; and the subject of the course is "Cellulose, the chemistry of vegetable fibres, and of their industrial preparations and uses." The fee for the whole course is £1 1*s.*, which, in the case of those who earn weekly wages, may be paid in two instalments. (2) A Saturday morning course for teachers, at University College, by Prof. Karl Pearson, on "Graphic Methods." The course deals mainly with the use of the drawing-board in elementary, geometrical, and mechanical teaching. The admission to this course is free for teachers. The following lectures have also been arranged by the Professors at the two colleges. In the evenings, Prof. Hudson Beare and Prof. Fleming are giving courses at University College on Mechanical Engineering and Electrical Engineering respectively; while at King's College, Prof. Robinson is holding a course on Civil Engineering, Prof. Banister Fletcher on Architecture, Prof. Adamson Experimental and Practical Physics, and Prof. Hudson on Pure Mathematics. The fee for each of these courses is £1 1s. On Saturday mornings Prof. Capper is holding a course, at King's College, on the Strength of Materials, to be followed in January by a course on the Theory of Machines. In January Prof. Fleming will also commence a course, at University College, on Electricity and Magnetism. The Saturday morning courses are free for teachers. We are glad to make these courses known, because we feel that their success would induce provincial Technical Education Committees to pay more attention to the higher branches of scientific instruction than most of them do at present.

SCIENTIFIC SERIALS.

American Journal of Science, October.—On the rate of condensation in the steam-jet, by A. de Forest Palmer. Photographs of a vertical steam-jet were obtained with the aid of sunlight. The invisible portion has the general shape of the inner mantle of a Bunsen flame, and its outline depends upon the pressure of the jet and the velocity with which the condensation travels towards the nozzle. The author finds that the separation surface of the invisible portion is sharply marked, and that it oscillates up and down. The demarcation is probably due to the fact that the instantaneous heat of condensation is able to superheat the supersaturated steam as it arrives at the surface. The velocity of condensation increases markedly with the pressure; and since the initial velocity of the jet and the rate of decrease of its velocity in ascending also increase with the pressure, the amplitude of the oscillations decreases with it.—Abnormal hickory nuts, by F. H. Herrick. The author describes two hickory nuts of ordinary external appearance, but containing an endocarp strongly resembling an acorn, and supposed to be cases of hybridism between the oak and the hickory. The minute anatomy of their structure gives no direct evidence of hybridism, but the variation undoubtedly arose at the time of fertilisation, and is at present unexplained. —Separation and identification of potassium and sodium, by D. A. Kreider and J. E. Breckenridge. These metals may be effectively and delicately separated by converting their salts into perchlorates and precipitating the potassium with 97 per cent. alcohol. The sodium is then precipitated by blowing gaseous hydrochloric acid into the alcoholic filtrate.—A new method for reading deflections of galvanometers, by C. B. Rice. The method is based upon Gauss's mirror and scale method, but the telescope is replaced by a lens at a short distance from the mirror. The latter is perforated in the centre, and through the hole is seen a black arrow on a white ground placed at an equal distance beyond the mirror, which, being in the same plane as the reflected scale, serves as a pointer, and obviates the necessity of a telescope.—The action of ferric chloride on metallic gold, by P. C. McIlhiney. Ferric chloride by itself, or hydrochloric acid in presence of air, have no action on gold. But a mixed solution of hydrochloric acid and ferric chloride dissolves gold when oxygen is present, the ferric chloride acting as a carrier.

American Journal of Mathematics, vol. xviii. No. 4, October. —Mr. E. H. Moore concludes his tactical memoranda i.-iii. with several more "whist-tournament arrangements," and gives a short list of the published literature of the subject.—In the Étude de Géométrie Cinématique réglée, M. René de Saussure proposes to establish a purely synthetical correspondence entre les points de la surface imaginaire et les droites de l'espace, de manière à obtenir une géométrie de l'espace réglé basée sur la géométrie supposée connue, de la surface. He discusses first the principles of the synthetic geometry of such a space, and then the kinematic geometry of the same space. He next gives applications of his theory. In this theory la ligne droite est prise comme élément d'espace, non-seulement au point de vue géométrique, mais aussi au point de vue mécanique; cette manière devoir conduit à la conception d'une *cinématique réglée*. La raison d'être de cette branche de la cinématique provient du fait que le déplacement le plus général d'un corps solide est une torsion et l'effort le plus général exercé sur un solide est ce que Plücker appelle un dyname et Ball un torseur (wrench); car l'effort que développe un dyname ou un torseur s'exerce sur une droite de même qu'une force s'exerce sur un point, puisque le vectangle est à la droite ce que le vecteur est au point.—The volume closes with a paper by Goursat, entitled "Sur les équations linéaires et la méthode de Laplace." In it the author develops, at some length, a recent note which he presented to the Academy of Sciences (*Comptes rendus*, t. cxxii., January 27, 1896).

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 19.—M. A. Chatin in the chair.—The President announced the death of M. Trécul, Member of the Botanical Section, on October 15.—New researches relating to the decomposition of sugars, under the influence of acids, and especially with the production of carbonic acid, by MM. Berthelot and G. André. The experiments were partly conducted in sealed tubes at 100°, partly in open flasks, at the boiling point. Estimations were made of carbonic acid, carbon monoxide, formic acid, levulic acid, humic acid, and unattacked glucose. Besides glucose, experiments were carried out with levulose, galactose, and maltose. The principal reaction appears to be the formation of humic acid; carbonic acid is also formed in not inconsiderable quantity.—Determination of the magnetic elements at sea. Applications of the observations made by M. Schwerer on the *Dubourdieu*, by M. E. Guyon. Since the formulæ developed by Archibald Smith and by Börgen for correcting the readings made at sea, were worked out for ships into the construction of which comparatively little iron entered, it became necessary to make a fresh study of the corrections to be applied to readings taken upon warships as built at present. In the method here indicated all the constants necessary for the corrections for each kind of observation (declination, inclination, and total force) are deduced exclusively from observations of the same nature.—On the work carried out at the Observatory of Mount Blanc in 1896, by M. J. Janssen. The work has been considerably impeded by the bad weather prevailing, the actinometric observations being especially interfered with. The large telescope (33 cm. diameter) has been successfully mounted, and the observations on the values of the acceleration due to gravity at different points on the mountain have been continued.—Study of the digestibility of cocoa-butter and ordinary butter, by MM. Bourot and F. Jean. Comparative experiments carried out with the same person showed that 95·8 per cent. of ordinary butter is digested, and 98 per cent. of cocoa-butter. An abnormally large quantity of fat in the food causes less disturbance if the fat is cocoa-butter than if it is present as ordinary butter.—Some colour reactions of brucine: detection of nitrous acid in presence of sulphites, by M. P. Pichard. The red colouration produced in an acid solution of brucine by a nitrite is capable of showing one part of nitrous acid in 640,000 parts of water, and is more sensitive in the presence of sulphites and hyposulphites than the tests proposed by Griess, Tromsdorff, and Piccini.—General principles relating to the physics of space, by M. J. Poulin.—Tempests and cyclones, by M. A. de Langrée.—Note on aërial navigation, by M. Caravanier.—On some peculiarities of solubility curves, by M. H. Le Chatelier. Some experiments on the melting points of some double salts and alloys, showed that in the neighbourhood of the composition corresponding to a definite combination ($SnCu_3$, $SbCu_2$, Al_2Cu, &c.), the curve showed a maximum temperature in the form of an angular point, which did not necessarily correspond exactly to the point of definite composition. The theoretical discussion elucidates the reason for this peculiarity.—Influence of pressure in the changes of state of a body, by M. A. Ponsot.—On the property of discharging electrified conductors, produced in gases by the X-rays and by electric sparks, by M. E. Villari. It is shown that a gas confined in a tube, and exposed to the X-rays, acquires rapidly the power of discharging an electrified disc, and keeps this property for some time. The passage of a series of sparks from a coil strengthened by a condenser, confers the same property upon a gas.—On the action of the silent discharge upon the property of gases of discharging electrified conductors, by M. E. Villari. Gases subjected to the action of a series of sparks acquire an increased conductivity for heat. The silent discharge is not able to put the gas into the condition in which it can discharge an electrified body, but if a gas which has been subjected to X-rays, and which therefore is in this condition, is subjected to the silent discharge, it is no longer able to affect a charged gold-leaf electroscope.—Succession of the atomic weights of the elements, by M. Delauney. An attempt to classify the elements according as their atomic weights are expressed by: $4n$, $4n + 3$, $4n + 2$, or $4n + 1$.—Phosphopalladic ethers. Ammoniacal derivatives of phosphopalladous and phosphopalladic ethers, by M. Finck.—Law of the establishment and persistence of the luminous sensation, deduced from new experiments upon rotating discs, by M. Charles Henry.—On the jaws in insects, by M. Joannes Chatin.—On the habits of *Evania Desjardinsii*, by M. E. Bordage.—New observations on the bacteria of the potato, by M. E. Roze.—Some remarks on the kerosine shale of New South Wales, by M. C. E. Bertrand.—On the microgranulites of the Ferret valley, by MM. L. Duparc and F. Pearce.—On the mode of formation of the Pyrenees, by M. P. W. Stuart-Menteath.—Contribution to the theory of the movements of storms, by M. J. Vinot.

AMSTERDAM.

Royal Academy of Sciences, September 26.—Prof. Stokvis in the chair.—Prof. Korteweg, who, as delegate of the Dutch Government, attended the Royal Society conference on the desirability of preparing a catalogue of scientific works, spoke of this conference, and entered into some details concerning its purpose, the nature of the resolutions passed, the task of the national bureaux, and the arrangement of the subject-index. Prof. Haga exhibited two negatives which prove the existence of different kinds of X-rays, a conclusion also arrived at by other investigators. At a high degree of rarefaction in the vacuum-tubes the penetrating power of the rays through flesh and bone is very different, so that the outlines of the bones are very distinct, whilst, when the rarefaction is less great, these two bodies transmit the rays in about the same degree.—Prof. Kamerlingh Onnes made, on behalf of Dr. L. H. Siertsema, a communication on measurements of magnetic rotations, carried out in the Leyden Physical Laboratory. With the apparatus described in former communications determinations have been made of the absolute rotation constant of water, with the object of controlling the reduction-factor, with which the rotation determination has been reduced to an absolute measure. The result found is 0·01302′ at 13·4°, which corresponds very well with the constants found by Arons and by Rodger and Watson. A second communication again gave the results for gases, as they have undergone a slight alteration, owing to a necessary correction in the manometer readings.—Prof. Kamerlingh Onnes also communicated Dr. Zeeman's measurements on the variation of the absorption of electrical waves with the wave-length and the concentration of the electrolyte. The results, which hold good between limits given in detail in the paper, are: the coefficient of absorption changes as the square root of the conductivity of the solution, and it does not change, if conductivity and wave-length vary in the same ratio.—Prof. Engelmann communicated the results of an investigation into reflexes of the auricle of the heart, made by Mr. J. J. L. Muskens in the Utrecht Physiological Laboratory, by experimenting upon frogs' hearts.

DIARY OF SOCIETIES.

FRIDAY, OCTOBER 30.

PHYSICAL SOCIETY, at 5.—Special Meeting, after which, at an Ordinary Meeting—A Satisfactory Method of measuring Electrolytic Conductivity by means of Continuous Currents: Prof. W. Stroud and J. B. Henderson.—A Telemetrical Spherometer and Focometer: Prof. W. Stroud.—An Experimental Exhibition: R. Appleyard.

SATURDAY, OCTOBER 31.

ESSEX FIELD CLUB, at 6.30 (at Chingford)—Short Report, by the Curator, on the first year's work at the Epping Forest Museum.—Our Forest Trees, and How they should be represented in the Museum: Prof. G. S. Boulger.—Notes on the Conference of Delegates of the Corresponding Societies of the British Association, Liverpool, 1896: T. V. Holmes.

MONDAY, NOVEMBER 2.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Production of Inoculating Materials for Use in Agriculture (Nitragin): Dr. J. A. Voelcker.—The Smelting and Refining of Cyanide Bullion: Arthur Caldecott.

TUESDAY, NOVEMBER 3.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Address by J. Wolfe Barry, C.B., F.R.S., the President.

WEDNESDAY, NOVEMBER 4.

GEOLOGICAL SOCIETY, at 8.—Additional Note on the Sections near the Summit of the Furka Pass (Switzerland): T. G. Bonney, F.R.S.—Geological and Petrographical Studies of the Sudbury Nickel District (Canada): T. L. Walker (communicated by J. J. H. Teall, F.R.S.).—On the Distribution in Space of the Accessory Shocks of the Great Japanese Earthquake of 1891.

ENTOMOLOGICAL SOCIETY, at 8.

INSTITUTION OF MECHANICAL ENGINEERS, at 7.30.—Research Committee on the Value of the Steam Jacket; Experiment on a Locomotive Engine: Prof. T. Hudson Beare and Bryan Donkin.—Transmission of Heat from Surface Condensation through Metal Cylinders: Lieut.-Colonel English and Bryan Donkin.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Note on Ginger: Thos. B. Blunt.—The Determination of Stearic Acid in Fats: Otto Hehner and C. A. Mitchell.—Further Note on Lead in Canadian Cheese: F. Wallis Stoddart.

THURSDAY, NOVEMBER 5.

CHEMICAL SOCIETY, at 8.—The Constitution of Nitrogen Iodide: Dr. F. D. Chattaway.—Note on the Solution and Diffusion of certain Metals in Mercury: Prof. Roberts-Austen, C.B., F.R.S.—Compounds of Metallic Hydroxides with Iodine: J. Rettie.—The Economical Preparation of Hydroxylamine Sulphate; The Reduction of Nitrosulphates; and Amidosulphonic Acid: Dr. E. Divers, F.R.S., and Dr. T. Haga.—The Molecular Conductivity of Amidosulphonic Acid: Joji Sakurai.—Physiological Action of Amidosulphonic Acid: Dr. Oscar Loew.—Imidosulphonates. Part II.: Dr. E. Divers, F.R.S., and Dr. T. Haga.—How Mercurous and Mercuric Salts change into each other: Seihachi Hada.—The Effect of Heat on Aqueous Solutions of Chrome Alum: Margaret D. Dougal.—The Saponification of Ethylic Dicarboxyl Glutaconate: Dr. H. W. Bolam.—The Periodic Law: R. M. Deeley.—The Colouring Matters occurring in British Plants: A. G. Perkin.—Carbohydrates of Cereal Straws: C. F. Cross, E. J. Bevan, and Claude Smith.

LINNEAN SOCIETY, at 8.—Mediterranean Bryozoa: A. W. Waters.—On some New Species of Crassula from South Africa: Dr. S. Schönland.—Holothurians of New Zealand: A. H. Dendy.

INSTITUTION OF MECHANICAL ENGINEERS, at 7.30.—Breakdowns of Stationary Steam-Engines: Michael Longridge.

FRIDAY, NOVEMBER 6.

GEOLOGISTS' ASSOCIATION, at 8.—Conversazione and Exhibition of Specimens.

BOOKS, PAMPHLET, and SERIALS RECEIVED.

BOOKS.—General Report on the Operations of the Survey of India Department, 1894-95 (Calcutta).—Practical Work in Physics; W. G. Woolcombe. Part 3. Light and Sound (Oxford, Clarendon Press).—Firth College, Sheffield, Sheffield School of Medicine, Calendar, 1896-97 (Sheffield).—Elements of Mechanics: Dr. T. W. Wright (Spon).—A History of Gardening in England: Hon. Alicia Amherst, 2nd edition (Quaritch).—Les Galets Coloriés du Mas d'Azil: Ed. Piette (Paris, Masson).—The Method of Darwin: F. Cramer (Chicago, McClurg).—Les Accumulateurs Electriques: F. Loppé (Paris, Gauthier-Villars).—Annalen der Kaiserlichen Universitäts-Sternwarte in Strassburg, i. Band (Karlsruhe).—Journal of the Right Hon. Sir Joseph Banks, edited by Sir J. D. Hooker (Macmillan).—Index Operum Leonardi Euleri: J. G. Hagen (Berolini, Dames).—Experience: Rev. W. Richmond (Sonnenschein).—A New Course of Experimental Chemistry, revised edition (Murby).—The Life and Letters of George John Romanes, new edition (Longmans).—Report on the Geodetic Survey of South Africa, executed by Lieut.-Colonel Morris in 1883–1892 (Cape Town, Richards).—Model Drawing and Sharing from Casts: T. C. Barfield (Chapman).—Cheese and Cheese-making, &c.: J. Long and J. Benson (Chapman).—An Introduction to Human Physiology: Dr. D. J. Waller, third edition (Longmans).—Die Mineralogie des Harzes, and Atlas: Dr. O. Luedecke (Berlin, Gebrüder Borntraeger).

PAMPHLET.—Sociedad Cientifica Argentina. Semillas y Frutos: Prof. A. Gallardo (Buenos Aires).

SERIALS.—Journal of the Chemical Society, October (Gurney).—Record of Technical and Secondary Education, October (Macmillan).—Quarterly Review, October (Murray).—Psychologische Arbeiten, i. Band, 4 Heft (Leipzig, Engelmann).—L'Anthropologie, tome vii. No. 4 (Paris, Masson).—American Naturalist, October (Philadelphia).—Journal of the Franklin Institute, October (Philadelphia).—Zeitschrift für Physikalische Chemie, xxi. Band, 1 Heft (Leipzig).—The Bachelor of Arts, October (New York).—Journal of Anatomy and Physiology, October (Griffin).—Astrophysical Journal, October (Chicago).—Brain, Parts 74 and 75 (Macmillan).—Royal Natural History, Part 36 (Warne).—Bibliotheca Geographica, Band 2, Jahrg. 1893 (Berlin, Kuhl).—Proceedings of the Royal Society, Edinburgh, Session 1895-96, Vol xxi. No. 2, Pp. 65 to 160 (Edinburgh).—Journal of the Asiatic Society of Bengal, Vol. lxv. Part 2, No. 2 (Calcutta).—Sunday Magazine, November (Isbister).—Good Words, November (Isbister).—Himmel und Erde, November (Berlin, Paetel).—American Journal of Psychology, Vol. viii. No. 1 (Worcester, Mass.).

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