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MAN AND SCENERY.

Landscape in History and Other Essays. By Sir Archibald Geikie, F.R.S. Pp. viii+352. (London: Macmillan and Co., Ltd., 1905.) Price 8*s.* 6*d.* net.

IN this collection of essays Sir Archibald Geikie has given us in a connected form some of his contributions to the study of the effect of geographical environment and geological changes, not only in determining the distribution of population and of the centres of rule and of commerce, but also in influencing literature and the interpretation of history. In some of them he treats of the part man has played in controlling and directing those forces of nature which tend to produce change on the surface of the earth, and he has added a few essays dealing with subjects which arise naturally out of such inquiries. In this way he has produced a most readable book, the several parts of which hang well together.

When we have exhausted all the available documents, sought out the meaning of all the descriptive place-names and gathered the local traditions, there remains the most trustworthy evidence of all, namely, the examination of the ground to see whether the events recorded can have occurred on the area to which they have been assigned, either under present conditions or other conditions the former existence of which we can learn from what we see. Our author gives as an example the story of the Battle of Bannockburn, where the army of Edward was compelled to crowd its attack into a narrow space because Bruce had rested his left flank on what the trained eye can see must at that time have been a morass with impassable bogs and sheets of water, though it is now dry and richly cultivated.

Estuaries and the rivers which run into them provided landing places and opened up the inland regions to the vessels of primæval man, and on their banks were sites for the settlements of the first comers and the cities of later more civilised times; while, on the other hand, mountain ranges and tangled forests separated tribes and offered an insurmountable barrier to expansion and intercourse.

Man, by cutting down or burning forests, and by draining lakes and swamps, has altered the conditions of many extensive tracts of country, changing the climate, the amount of rainfall, and the rate of waste of the hill-slopes and valleys.

The south of Scotland and parts of the north of England were once covered with small shallow pans of water like Finland, "the land of a thousand lakes." Most of these have got filled up in the British Isles, and the process of reclaiming and cultivating the areas once covered with water has been hurried on by the advance of agriculture; but history tells us how the early dwellers in these broken grounds took advantage of them in their struggles against the powerful races that from age to age invaded them. The Caledonians met the Romans on such ground, and the Scotch the English in later times; and, further south, the Saxons long held their own in the flooded fenlands against William and his Norman followers.

The mythology of Greece and of northern Europe is largely influenced by the character of the scenery in which it took shape. It was recognised that the plain of Thessaly had once been covered with a sheet of water, of which the remaining portions formed two considerable lakes. The opening of the gorge by which it was drained was attributed to Poseidon, the God of the Sea, or in later times to Hercules. Here we seem to have the tradition of an old controversy as to whether the sea, the natural operation of water running out of a lake or connected with inroads of the sea, or even artificial operations, had contributed most to bring about the draining of the area.

The snowy summits of Olympus, rising serenely above the shifting clouds into the calm, clear, blue heaven, naturally came to be regarded as the fit abode of the gods who ruled the world, and soon Olympus came to be synonymous with heaven itself.

So, also, in the countries of western and northern Europe the grandeur and ruggedness of the scenery and the "mountain gloom" are faithfully reflected in the Teutonic myths and superstitions.

Our author gives three examples of typical districts to show how a knowledge of the causes which have brought about the varied scenery of each, far from checking the free play of fancy, enhances the pleasure derived from their contemplation.

He takes first the little cake of rock which caps Slieve League in Ireland, and leads the imagination to recall the time when it extended over all the surrounding area; but it has been removed over most of the district, a patch being left here and there to indicate the wide area over which it once extended.

Then our author takes us to the Isle of Wight, and showing us the "long backs of the bushless downs," explains how they come to rise as they do from the waves and run across the island from side to side. The long story that they tell is a stimulus to the imagination that greatly heightens the pleasure derived from the scene.

Again he carries us to the flanks of Slioch and the shores of Loch Maree, and makes them tell their tale.

He then goes on to describe the influence of scenery upon our literature. Here he is, of course, dealing with a later stage of mental development, and what he gives us is chiefly a sketch of the distinguishing physical features which inspired the descriptive passages in the poets of nature.

He tells us of the simple, child-like delight in nature which was so characteristic of Chaucer. He points out the placid rural quiet of the Colne Valley, where Milton dwelt, and which inspired the two finest lyrics in the English tongue. He describes the scenery of the Ouse near Olney and Weston, so thoroughly characteristic of the southern lowlands which filled Cowper with images of rural peacefulness and gentle beauty.

He points out how the poetry of Thomson ever showed the impress of his early life in the Scottish lowlands within sight of the Cheviot and Lammermuir Hills.

Our author is at his best when he comes to deal with the genius of Burns, to whom the hills and woods were not merely enjoyable scenes to be visited and described, but became part of his very being; who found in their changeful aspects the counterpart of his own variable moods, and whose feelings found vent in an exuberance of appreciation which had never before been heard in verse.

He touches lightly the descriptive passages in Scott and Wordsworth, and the ballad singers of the border, who, though mostly inspired by war-like achievements, often wove into their tales a thread of tender affection and romance. In the poems attributed to Ossian, although Highland scenery is not specially described, it forms a visible and changing background.

Our author turns from the consideration of the influence exerted by the geographical features of a country upon the development and habits of thought of its inhabitants to the discussion of the origin of those features themselves. This is a subject which has of recent years received much attention both in this country and in America. Our author describes the scenic features under several heads. Mountains and valleys may be considered as correlatives, the mountains being there because the valleys have been scooped out between them. Under lakes, we turn with interest to his views on the glacial erosion of rock basins, which he holds could be effected by land ice only. He makes, however, the qualifying remark that a terrestrial surface of crystalline rock, long exposed to the atmosphere or covered with vegetation and humus, may be so deeply corroded as for two or three hundred feet downward to be converted into loose detritus, and the ice may thus have had much of its work done for it, and would be mainly employed in clearing out the corroded débris. Whether, however, this will explain many of the rock basins of the British Isles is not very clear.

In another essay he shows what Hutton did by his theory of the earth to pave the way for the accurate scientific treatment of all those questions of the changes which the earth has undergone in attaining its present configuration. Playfair, Hall, and others helped on the work. The obvious question arising out of such speculations is, how long must it have taken to bring about such great results? and thus we are taken through the controversies as to whether uniform change, which we observe, or local and intermittent catastrophic action, of which we see proofs everywhere, have done most to bring about the results in every individual case. The physicists tell us that from a consideration of the rate at which the earth parts with its heat, of the limitation of the age of the sun, of the retardation of the earth's angular velocity by tidal friction, they are not prepared to allow such a vast age as geologists have claimed for the earth. The geologists, on the other hand, having regard to the rate at which changes on its surface are observed to be brought about by existing agents, and the time demanded for the evolution of living things, insist upon a much larger estimate of time than the physicists are prepared to allow. The confidence reposed in the accuracy of such inferences must depend upon the probability or improbability that the observer has seen enough to justify his generalisations, and that no contradictory evidence can be forthcoming.

The geologist and physicist will probably arrive at a compromise when the one admits that his calculations, based on the rate of waste, may be entirely vitiated by earth movements, which will either hurry on or retard such waste, and that life will change more rapidly with the changes of environment produced by earth movements, and when, on the other hand, the physicist has corrected his estimate of the rate at which the earth is cooling by taking more careful account of the variety of conducting material of which the earth is composed, has estimated the planetary fuel for ever being thrown into the sun from space, to say nothing of the new views of radio-activity, and has re-considered his inferences from tidal friction, which some of our highest mathematicians admit is still open to doubt.

Such speculations suggest the name of the great apostle of evolution, and an essay on the life and work of Charles Darwin follows, while a biographical sketch of Hugh Miller is fitly introduced among essays which so largely deal with the influence of a man's environment upon his imagination and writings.

In an age like this, when the relative place and value of technical and literary training are so strongly forced upon the attention of the country, an essay on science in education by one whose experience and outlook are so wide will be welcomed. Then, to bring us back to the main subject with which he commenced, he gives an interesting sketch of the building up and moulding of the Campagna and the surrounding country, fitting it for the site of many an ancient city, and at last for the eternal city so long the centre of the world.

A MAGNETIC SURVEY OF JAPAN.

A Magnetic Survey of Japan reduced to the Epoch 1895·0 and the Sea Level. Carried out by order of the Earthquake Investigation Committee, reported by A. Tanakadate. Pp. xii+347 and plates. (Published by the University, Tokyo, Japan, 1904.)

THE completion of the detailed magnetic survey of a country is a task requiring great skill and industry. We congratulate Prof. A. Tanakadate and his colleagues on the successful accomplishment of a heavy piece of work, which will be welcomed by all who are interested in the science of terrestrial magnetism. The work is the result of the voluntary cooperation of sixteen observers, of whom seven are professors or assistant professors of the Imperial University, Tokyo, the others also occupying responsible positions. Prof. Tanakadate modestly only claims for himself the position of a "reporter" who has collected the work of the different parties, but we imagine that we owe to him also the detailed discussion of the results which forms an essential portion of the volume before us.

A clear account is given in the initial paragraphs of the method of observations and the instruments used, but not too much space is devoted to these details, so that the reader is soon brought to the first difficulty which occurred in the working out of the observations. It was necessary, in order to reduce them to a common epoch, to take account of secular variations. This might most easily have been done by choosing as observing stations the same places at which the magnetic elements had been determined in a previous survey, but in attempting to carry this out it was found that the changes which had taken place in their surroundings made it impracticable to observe at most of the old stations. Some other method of reduction had therefore to be adopted. Empirical expressions were found for the magnetic elements in terms of longitude and latitude similar to those deduced by Prof. Knott for the previous survey. A comparison of the two expressions gave the secular variation. The results of all the observations for each station are given in the report. The reduction of the observations to sea level is always to some extent arbitrary. The process employed in the present case, where use is made of relations given by the theory of the potential between the radial variation of the horizontal components and the horizontal variation of vertical force, is an improvement on the more empirical methods which have sometimes been adopted.

A further application of the potential theory may serve as an important check on the accuracy of the observations. If a potential exists, the rate of variation of the northerly force towards the west must be equal to the rate of variation of the westerly force towards the north. If this relation does not hold, the earth's magnetism cannot be completely represented by a potential, and this would mean that vertical electric currents traverse the earth's surface. The authors of the present survey calculate the intensities of these vertical currents, but rightly do not attach much importance to them. They are much greater than observations on atmospheric electricity allow us to contemplate as possible. We may therefore take the calculated values of these currents to be indications of the extent of uncertainty in the observations.

We must refer the reader to the original for the discussion of local disturbances, but cannot avoid directing attention to one passage, which seems to indicate some kind of misapprehension on the part of the author.

"It is often erroneously believed," he says, "that the expansibility of the earth's magnetic potential in negative powers of the radius vector is a proof that the source of action is inside the earth."

In a preceding sentence the writer connects his supposed error with the fact that "inasmuch as the surface integral of the force over the earth vanishes, the so-called seat of action may be placed either inside or outside."

In this passage the author seems to doubt a well-established theorem which is quite independent of the question whether the surface integral of normal force when taken over the whole surface of the earth has a finite value or not.

To put the matter plainly: If the magnetic forces at all points of the surface of a sphere can be represented in terms of a potential which is expressed as a series of spherical harmonics proceeding by negative powers of the radius vector, then there are no magnets or electric currents outside the sphere. If the passage quoted is intended to deny the truth of this proposition, the author is guilty of a heresy which he does not justify either by his hydrokinetic analogy or by his reference to one of Lord Kelvin's papers. It should be said, however, that in other parts of his volume the author seems to adopt Gauss's reasoning as to the discrimination between outside and inside effects by spherical harmonic analysis. It may be, therefore, that the apparent meaning of the passage is not the one which it was intended to convey. It is of some importance to avoid misunderstanding on so important a matter, and it is for this reason that I feel compelled to direct attention to the only criticism which can fairly be raised with regard to a very meritorious and heavy piece of work.

May other countries follow this example of Japanese enterprise, and may, especially in English colonies, scientific men receive such help from their Governments as will enable them to keep pace with foreign nations in the successful prosecution of similar work. It is not the enterprise or the knowledge which is wanting, but the material assistance and the official recognition that a certain duty is imposed on each country to take its share in the working out of geophysical problems. ARTHUR SCHUSTER.

THE TECHNOLOGY OF THE VEGETABLE FIBRES.

The Spinning and Twisting of Long Vegetable Fibres (Flax, Hemp, Jute, Tow, and Ramie). By Herbert R. Carter. Pp. xvi+360. (London: Chas. Griffin and Co., Ltd., 1904.) Price 10s. net.

WORKS written for the textile industries may be divided into three classes, viz. descriptive works of a more or less technical and practical character, educational works leading students up to an appreciation of the difficulties to be faced, and works which combine the descriptive and educational but which too frequently meet the requirements of neither manager nor student. The work under consideration meets the requirements of the mill manager or advanced student in a manner perhaps more than satisfactory. On the other hand, to place such a work as this in the hands of the elementary student would be anything but satisfactory, rather suppressing than developing that genuine interest without which it is impossible for the student to make true progress in his studies. In its particular line, however, we must highly commend the work as representing up-to-date practice in most of the sections of the textile industries of which it treats.

The work is really arranged in four sections, the first three chapters being devoted to general particulars respecting the fibres in question, chapters iv. to xv. dealing with the mechanical processes necessary for the formation of the said materials into satisfactory yarns, chapters xvi. and xvii. referring to

miscellaneous processes, such as the manufacture of threads, twines, cords, and ropes, while chapters xviii. to xxi. treat on general mill management, arrangement, and engineering.

In the first section, very interesting and useful particulars are supplied respecting the fibres and their marketing, the only difficulty being the grasping of the multitude of details here given. Had these details been represented by maps illustrating (*a*) area of growth, (*b*) area of manufacture, (*c*) area of distribution and use of the fibres in question, with graphical illustrations of quantities, &c., the facts presented would have been vastly more interesting and useful. This method, we believe, is employed in the textile museums of certain of our northern technical colleges.

The author wisely remarks in his preface that were it not for the similarity in the processes necessary for the preparation and spinning of many of the fibres here treated, it would be impossible to bring the work within reasonable limits. The similarity in treatment is certainly marked, and practically leads the author throughout to the employment of the "comparative method." Thus, in the first preparation of ramie, the hand and the chemical or mechanical methods are naturally compared with reference to quality of result and price, this latter necessarily involving the question of native hand-labour *versus* European machine-labour. Then the difference between ramie and flax is naturally noted, and so on.

The comparative method would naturally arrange itself under some six heads:—(1) methods of dealing with the fibres in the raw state commercially; (2) methods of preparing, that is, of cleaning for the subsequent mechanical operations; (3) ultimate length, diameter, colour, &c., of the fibres; (4) the conditions for preparation of the fibres as necessarily deciding the types of machines required; (5) the types of machines for each quality of fibre; (6) value of resultant thread or fabric as revealed by scientific and "use" tests.

This is approximately the grouping employed. The greater proportion of the book is devoted to the mechanical side, and it must be recognised that this is just, as in many cases not only has the machine taken the place of the hand method, but actually does what would be impossible without mechanical aid. Perhaps one of the most interesting comparisons in the book is that afforded by chapters xii. and xiii., in which dry, semi-dry, and wet methods of spinning are successively dealt with.

The section dealing with threads, twines, ropes, &c., is chiefly interesting as introducing machines which are practically unknown in the ordinary textile industries. It very often happens that principles developed in one industry would be of great value in another were they known; in this way the present work may indirectly be of considerable use to industries other than those specially dealt with.

Chapter xviii. deals in an interesting manner with the mechanical department, including the hackle setting, wood turning, fluting, oils, and oiling; this is certainly a useful chapter for the ordinary mill manager. Chapters xix., xx., and xxi., however, in our opinion, are somewhat out of place, it being impossible satisfactorily to consider modern mill construction, boilers and engines, steam and water power, and electric power transmission in the fifty-six pages devoted to this subject. Mere statement, usually very excellent, is all that is possible. We would, however, question the advice given respecting electric lighting in factories. There is a marked tendency to revert to incandescent gas lighting, not only on account of the expense, but also on account of the light value.

The work is not only to be commended to those engaged in the particular trades in question, but also to those engaged in the allied textile industries, as such questions as the position of the nip of the rollers in relation to the spindle and with reference to length of fibre, the varieties of gills employed, Combe's expansion pulley and quick change motion in place of the cones in cone drawing frames, &c., constitute interesting mechanical arrangements which may be of marked value in these allied industries.

The work is illustrated by 161 figures, usually of a most interesting type. The general arrangement is certainly such as will commend itself to the mill manager, who will naturally wish to refer to the work under conditions requiring speed and accuracy.

ALDRED F. BARKER.

ENGLISH ESTATE FORESTRY.

English Estate Forestry. By A. C. Forbes. Pp. xi+332. (London: Edward Arnold, 1904.) Price 12*s.* 6*d.* net.

AS the title suggests, the book is intended for the instruction of English foresters. In the preface, the author states that he feels,

"probably in common with many practical foresters, that English forestry is sufficiently distinct from Continental, or even Scotch forestry to entitle it to be regarded as a separate subject."

The author further emphasises this point in his chapter on thinning and pruning, where he seems to hint that all the mistakes and failures in English sylviculture, about the middle of the nineteenth century, were due to the bad influence of Scotch forestry and Scotch foresters, who, according to Mr. Forbes, were imported into England about that time, bringing with them their mistaken ideas of thinning and pruning, to the detriment of English forestry.

The following extract from the preface gives the author's own views regarding the book:—

"This book is intended to be suggestive rather than instructive to the practical forester. There is little in its pages but what he already knows, and possibly a great deal with which he will not agree. But as a more or less faithful record of individual experience it is offered as a small contribution to forestry literature, which, if it does not enrich, it will not, it is hoped, disgrace."

The concluding paragraph of the preface states

"that this book is not, nor does it make a pretence of being, a text-book. The intelligent reader, therefore, who discovers that it does not contain a planter's

guide, nor a reference to more than *one* work on German forestry, is requested not to despise it on that account, nor to conclude prematurely that the author has written on a subject he knows nothing about."

The book is a fairly bulky one, and consists of thirteen chapters and twenty-three illustrations, representing different woodland scenes. The opening chapter gives an interesting historical account of English forests and the origin of forestry. The present conditions, the future prospects and possibilities of extended afforestation are next dealt with. The sylvicultural treatment of the commoner coniferous and deciduous trees, and the financial results to be derived therefrom, is a chapter which will be read with interest by proprietor and forester alike. Planting and natural regeneration are dealt with in a satisfactory manner. A chapter on the measurement of timber and its selling value contains much information, which will be of the greatest use to the English estate forester. The home nursery and forest management receive their due share of attention. The author has not forgotten the arboricultural aspect of the forester's profession. His chapters on landscape forestry and park and avenue trees are written with much artistic feeling, and contain many valuable suggestions. The more important injurious fungi and animals, including insects, are dealt with in a chapter under the heading "Enemies of English Woodlands." It deals with only a few of the outstanding pests which are of practical importance. There is probably no pest about which more has been said or written than the larch canker disease, and we find the author is no exception to the rule. A great many pages are devoted to this disease alone. It consists essentially of a criticism of all the theories that have been advanced regarding the disease since the introduction of the larch. Much of what he says is undoubtedly true, but we must confess we find great difficulty in following the author through many of his arguments, especially those which are based upon purely suppositional grounds.

Regarding the book as a whole, we find a great deal of historical detail in its pages. Past and present methods are criticised without reserve. It will not replace any of the already existing text-books intended for the instruction of the young forester, but as an addition to our existing literature on forestry we may recommend its perusal to those interested in the subject.

OUR BOOK SHELF.

Index Kewensis Plantarum Phanerogamarum. Supplementum secundum, nomina et synonyma omnium generum et specierum ab initio anni MDCCCXCVI usque ad finem anni MDCCCC complectens. Ductu et consilio W. T. Thiselton-Dyer confecerunt herbarii horti regii botanici Kewensis curatores. Abama-Leucocoryne. Pp. 103. (Oxford: Clarendon Press, 1904.) Price 12*s.* net.

WORKERS at the systematic botany of seed-plants, and all who are concerned that plants should have their right names, will welcome the appearance of this latest instalment of a well-known work of reference. The original "Index Kewensis," the monumental work owed to Sir Joseph Hooker and Mr. Daydon Jackson, gives the reference for generic and specific names published up to 1885. For names published during the next ten years we have the first supplement, the work of M. Durand, of Brussels, and Mr. Jackson. This makes but slow progress, and has now reached Ph; the last number appeared at the end of November, 1903. Hence, while the present instalment carries us, for the first half of the alphabet, to the end of last century, as regards the last ten letters we are twenty years behind time!

As implied in the heading, the supplement includes not only new names, but also synonyms, that is, those names which, in works published in the interval in question, have been transferred to other genera or regarded as identical with names previously published. Thus the eight names under Eriachne represent old species, chiefly of Nees, which more recent workers have transferred to Achneria. The inclusion of synonymy, while undoubtedly of value, must add considerably to the labour of preparation. Moreover, while in some cases the citation of a name as a synonym is amply justified, it is in others merely the expression of the opinion of one school of botanists, or perhaps only of an individual worker, on a matter about which perhaps much may be said on both sides. In our opinion the great use of the "Index" is that implied in its title; the working botanist wants a list containing every published name, he wants it as soon as possible after publication, and to get an exhaustive and up-to-date index he will sacrifice much in the way of botanical comment, however valuable. Refer him to the place and date of publication, and you will earn his lasting gratitude. He should be able to draw his own conclusions as to the relative value of the names.

The omission of the date from the references is, we think, matter for regret; it would have involved but very little additional labour at the time; moreover, it is given in the first supplement, an improvement instituted by Messrs. Durand and Jackson. There are also other omissions which we shall hope to see rectified in an appendix or addendum. A. B. R.

Birds I have Known. By Arthur H. Beavan. Pp. 256. (London: T. Fisher Unwin, 1905.) Price 5*s.*

THIS little book records the author's "experience of birds during many years in many lands and on many seas . . . its sole purpose being to bring to its readers' notice the ways and habits of these beautiful creatures of the Almighty."

With such a preface, and after the author's assurance that he prefers the unquestioning belief of his little son in the Bible story of Creation to the Darwinian theory of evolution, we are a little taken aback at the author's treatment of the Creator's handiwork.

"I have always loved the birds," he protests. Unfortunate birds! His earliest manifestation of this love was, on his own confession, to endeavour to catch them with the proverbial pinch of salt! Age brought wisdom, however, and with the judgment of mature years a piece of pork concealing a fish-hook was found more efficacious!

In other places he naïvely describes the patience he displayed in waylaying with a gun such rare birds as he happened to discover. Descanting upon the glories of Cornwall as a happy hunting-ground, he gives a list of the rarities that may turn up here during gales, enumerating such species as the golden oriole, Bohemian waxwing, hoopoe, and spoonbill—just those, in short, which the true bird-lover is most anxious to protect. The chance of killing such

prizes, he assures us, makes the ornithologist "despise common bird-life," and look only for rarities!

Concerning the toucan and hornbill, he writes:—"The Almighty—speaking reverently—seems to have made certain animals and birds (*sic*) in a spirit of fun, or at least in a sportive mood"!! And this, too, in spite of a statement on a previous page to the effect that with "an ordinary beak" the toucan would be unable to procure the fruit on which it feeds, and that, in consequence, "the Almighty, in His wisdom, has provided it with a 'beak-hand'. . . ."!

We confess we do not like this book; where it is not mischievous it is puerile. The illustrations could not possibly be worse. W. P. P.

The Elements of Chemistry. By M. M. Pattison Muir. Pp. xiv+554. (London: J. and A. Churchill, 1904.) Price 10*s.* 6*d.* net.

IT is somewhat difficult to understand for what class of reader this book is intended. In style and treatment it is not well adapted to beginners, yet in its descriptive matter it is quite elementary. Probably it will prove of greatest service to mature students of other subjects who wish to gain some acquaintance with the principles of chemistry without intending to study the science practically. The author tells us in his preface that his object has been "to present some of the fundamental facts, generalisations, principles and theories of chemistry, lucidly, methodically, and suggestively." In this he has had a certain measure of success, but the general impression left by the book is that in its construction substance has been sacrificed to form. When, for example, the author tells us (p. 89) that weighed quantities of the basic oxides BaO, CaO, K_2O, Na_2O, have been combined with weighed quantities of the acidic oxides I_2O_5, N_2O_5, P_2O_5, P_2O_5 respectively, and that analysis showed the resulting products to be BaI_2O_6, CaN_2O_6, K_3PO_4, and Na_3PO_4, we are inclined to doubt the statement, and also to doubt the wisdom of adducing imaginary experiments in confirmation of a formal rule. On p. 252 we find the equation

"$Na_2O+N_2O_5$ (heated)$=2NaNO_3$."

We wonder if the author tried the experiment; the practical instruction to heat would almost indicate that he had.

Richard Jefferies: his Life and Ideals. By H. S. Salt. New edition. Pp. vii+119. (London: A. C. Fifield, 1905.) Price 1*s.* 6*d.* net.

THE fact of a new (and cheaper) edition of this work being called for may be taken as an indication of the hold the writings of the great pioneer of the true type of nature-study have taken on the popular mind. In the preface, the author emphasises his opinion that the real claims of Jefferies to literary immortality are based on his later works of the type of "The Story of My Heart"; but there can be no doubt, as the author himself is fain to admit, that "The Gamekeeper at Home" and "Round about a Great Estate" are the volumes which have made the name of Jefferies a household word. Biographers and eulogists may make what efforts they please to alter the verdict of the public; but in such cases the old maxim that the *vox populi* is *vox dei* still holds good. To the great majority of readers Jefferies will continue to be known solely by his inimitable (if sometimes too realistic) descriptions of rural life and character. Although in small type, the new edition of his life is well printed on good paper. R. L.

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.*]

Historical Note on Dust, Electrification, and Heat.

YOUR readers may remember that in July, 1883, I penned a letter to your columns (vol. xxviii. p. 297) describing some observations which the late J. W. Clark and myself had recently made; among others, one to the effect that a small electrical discharge into a smoke-laden atmosphere rapidly dissipated the smoke by coagulating the particles. Some time afterwards we found that the observation had previously been made by a Mr. Guitard, and printed in the *Mechanic's Magazine* for 1850—a reference to this fact being actually contained in that great compendium of electrical information, Wiedemann's "*Galvanismus u.s.w.*," so that it must be regarded as fully "published."

I now write to say that during the labour of indexing, at the Royal Society, Prof. McLeod has come across a much earlier instance of the same observation, showing that the phenomenon was really discovered in 1824. An extract from Prof. McLeod's letter runs as follows:—

"In the course of our indexing we have come across a paper that may interest you, if you do not already know of it. It is by Hohlfeld, "Das Niederschlagen des Rauchs durch Elektricität," Kastner, *Archiv Naturl.*, ii., 1824, 205–206. It is very short; he refers to the increase of the fall of rain and hail after a flash of lightning, and describes how he filled a globe with smoke and led into it a pointed wire connected to an electric machine which caused the smoke to settle."

If any importance attaches to the subject, it must depend upon the successful application, in future practice, of so conspicuous a result. Hitherto the only practical application of the same sort of principle has been the "coherer" used in some systems of wireless telegraphy, of which Prof. Branly's porphyrised-copper powder-smears and iron filings-tubes may be regarded as the earliest examples.

Perhaps, however, I may direct attention to my paper to the British Association (Report for 1885, pp. 743 *et seq.*), in which this electrical action on visible particles is likened to chemical agglomeration into molecular aggregates, leading to an electrostatic theory of chemistry, a matter worthy of, and now receiving, sustained attention.

May I further take the opportunity of amending an oversight? Mr. Clark and I came across the fact of the electrical deposition of smoke while we were experimenting on Tyndall's dark plane or dust-free space seen near hot bodies in illuminated air, a matter to which attention had been directed by a notable investigation of Lord Rayleigh's (see NATURE for 1882, vol. xxviii. p. 139). It turned out afterwards that we were not the only experimenters on this subject, Lord Rayleigh's letter having also roused the attention of that eminent specialist in dust researches, Mr. John Aitken, of Edinburgh; and though we published our account of dust-free spaces due to heat in the *Philosophical Magazine* for March, 1884, his corresponding investigations and explanations were published a month or so earlier in the *Transactions* of the Royal Society of Edinburgh, vol. xxxii. p. 239; and to him accordingly belongs priority in such parts of this matter as are not covered by my preliminary letter to NATURE of the July previous, which doubtless includes many things that were practically anticipated by Lord Rayleigh himself.

I mention this now because I have been rather too apt to forget it, and have omitted to mention Mr. Aitken's name when, if I had had all the circumstances consciously before me, I should certainly have mentioned it. In particular, in a history of the coherer principle contained in my little book on "Wireless Signalling," third edition, p. 75, I speak of the explanation of the dust-free space round a hot body, due to a molecular bombardment, as having been first published by ourselves, instead of by Mr. Aitken, whose name, I regret to say, does not appear; this is the oversight I wish to amend.

April 12. OLIVER LODGE.

The late Prof. Tacchini.

As a tribute to the memory of the late distinguished Italian astronomer, of whom an obituary notice appeared in the columns of NATURE last week, may I be permitted to add a few personal reminiscences? Prof. Tacchini took part in the eclipse expedition of 1875 to the Nicobar Islands. He joined our party from India, where he had been staying from the previous year, having been commissioned by his Government to make observations on the transit of Venus of 1874. The Italian Government sanctioned his remaining in India until the following year in order that he might make use of the opportunity with the instruments in his charge for the observation of the forthcoming total solar eclipse. Of the little band of observers who assembled on the Island of Camorta in April, 1875, most are happily still with us. Vogel, the introducer of "orthochromatic" photography, has passed away, but Pedler, Waterhouse, and others will remember the pleasant *camaraderie* which existed between ourselves and our Italian colleague. The expedition failed in its object through a cloudy sky, and we were all more or less the victims of intermittent malarial fever; but we made the best of adverse circumstances, and under conditions which, to many a party of observers similarly placed, would have been extremely trying, the good understanding which the members had arrived at among themselves helped to lighten the burden of our disappointment. Not the least weighty factor in the formation of this good fellowship among the representatives of different nations was the geniality of Tacchini, with whom we parted on the P. and O. steamer *Baroda* on the homeward voyage with every regret.

April 15. R. MELDOLA.

Propagation of Earthquake Waves.

MR. RUDZKI, in his letter to NATURE of April 6, observes that "it is only for perfectly elastic and isotropic bodies that the separation of the dilatational (normal) from the tortional (transverse) wave takes place with certainty"; and his conclusion is that "it is more than highly improbable that the effect of internal friction would neutralise the effect of æolotropism." If the term "internal friction" is intended to refer to the effect of pressure, this objection was forestalled by Major Dutton by the remark that "towards this more compact and continuous condition (of a compact mineral substance with a feeble pronounced cleavage), the pressure of great depths in the earth should, it may seem, tend to bring the material subject to it."

To me it is refreshing to learn that any objection can be raised to the view that the two speeds of earthquake waves are respectively condensational and tortional, the latter being held to prove a high degree of rigidity for the interior of the earth.

To examine the question whether the interior is to a considerable depth liquid or solid formed one subject of my "Physics of the Earth's Crust," and I came to the conclusion that it is liquid; and, so far as I am aware, my arguments have never been refuted. On this question Sir A. Geikie writes (NATURE, February 9), "the geological belief rests upon a large body of evidence from the structure of the terrestrial crust, which it is difficult or impossible to explain except on the supposition of an internal mass which, at least in its outer parts, is sufficiently liquid to emerge at the surface as molten lava."

To produce arguments on the opposite side of the question is another matter, and that derived from the two speeds of earthquake propagation is perhaps the strongest. I was consequently led to inquire whether the same result could not be obtained on the hypothesis of a liquid magma holding water gas in solution, subject to Henry's law that the same volume of gas can be absorbed by a given volume of the liquid at all pressures. The result which I obtained was that two waves would be propagated with different velocities, the one a condensational wave depending on the elasticity of the liquid, and the other a wave depending upon the pressure and the volume of the gas which could be held in solution by a given volume of the liquid.

If e be the elasticity of the liquid and D its density, then $\sqrt{e/D}$ will be the velocity of the condensational wave. And if P be the pressure and rV the volume of gas which can be held in solution by the volume V of the liquid, then $\sqrt{P/rD}$ will be the velocity of the gaseous wave. If we accept Laplace's law of density, P/D will increase with the depth, and r will probably decrease, hence the velocity of the gaseous wave will increase (*Proc.* Cambridge Phil. Soc., vol. xii., part v., 1903).

Harlton, Cambridge, April 10. O. FISHER.

The Ancient Races of the Thebaid.

ON my return to Oxford I saw Prof. Pearson's letter in your issue of March 30.

Since Prof. Pearson admits that he is not an anatomist, it would serve no useful purpose to discuss with him the anatomical value of the criteria which Mr. MacIver and I employed in our analysis of the skulls of the ancient inhabitants of the Theban province of Egypt.

The letter may be regarded as an interesting record of a method of interpreting percentage values adopted by a professed statistician. ARTHUR THOMSON.

Oxford, April 8.

THERE is an old saying that all good science is shorthand common sense. I am sorry that Prof. Arthur Thomson does not think it worth his while in the case of his just published far-reaching negroid cranial criterion to convert the esoteric methods of the anatomist into simple language for the benefit of other readers of NATURE, if not for that of the "professed statistician." I hope he will meet me later when I ask him to discuss, as I propose shortly to do, the mathematico-statistical treatment of his volume, which is of a somewhat remarkable character. Meanwhile, in order to expedite those further investigations by professed craniologists which his discovery is exciting, it would be of great value if he would tell us to what negro series he, *a priori*, applied his criteria, and what percentages of pure negroid, non-negroid, and intermediate crania he found in that series. KARL PEARSON.

Inversions of Temperature on Ben Nevis.

THE recent letters of Mr. Dines and Mr. Rotch (NATURE, February 16 and March 30) have suggested that a note as to the occurrence of temperature inversions on Ben Nevis may be of interest.

During the thirteen years 1891–1903, occasions were not infrequent when the temperature at the top of the mountain (4406 feet) was higher than that at the base. These inversions have been grouped according as the summit temperature was the higher, (1) at one hour at least of the day; (2) at each of the twenty-four hours of the day; (3) on the mean of the twenty-four hours of the day.

The total number of cases in the thirteen years was as follows:—

	Class I.	Class II.	Class III.
January	7	—	3
February	18	1	5
March	11	—	1
April	9	—	—
May	7	—	—
June	8	—	—
July	4	—	—
August	4	—	—
September	22	—	3
October	15	—	5
November	29	3	8
December	24	5	8
Year	158	9	33

Thus inversions occurred at all seasons, but inversions continued throughout the twenty-four hours of the civil day only in February, November, and December, and those of Class III. only between September and March. The average difference of temperature between Ben Nevis and Fort William ranged from 16°·8 F. in April to 14°·4 in December, the mean for the whole year being 15°·4. Hence inversions were at all seasons large departures from the usual conditions.

The greatest inversion was recorded during the great frost of February, 1895, when at 9 a.m. on February 19 the summit was 17°·6 warmer than the base (Ben Nevis 33°·6, Fort William 16°·0). The longest continued inversion occurred during November 2–5, 1897, when the summit temperature was the higher for fifty-eight consecutive hours, the mean daily temperature on November 4 being 9°·7 higher on Ben Nevis than at Fort William.

The Ben Nevis observations, of course, afford a comparison only between the conditions at the summit and those at the base of the mountain. It is more than probable that on many occasions when the summit temperature becomes nearly, though not quite, as high as that at the base, there is an inversion of temperature in part of the air-column between the summit and sea-level.

ANDREW WATT.

Scottish Meteorological Society, Edinburgh, April 12.

Stanton Drew.

THE mysteries of this group of circles—the next in importance to those of Avebury and Stonehenge—are not yet fully unveiled, even by the very remarkable astronomical discoveries made in them by Sir Norman Lockyer or by his interesting description of them.

The diameter of the north-east circle is 97 English feet, or 100 of an old Mediterranean foot of 11·64 inches. This is within an inch or two of the diameter of the outer sarsen ring at Stonehenge, which is in itself a very significant fact. The diameters of the south-western and central circles are respectively 150 and 380 of this old foot, so that the diameters of the circles (within a very slight working error) are in proportion one to the other of 5, 7½, and 19, the latter being the Metonic cycle number.

The distances between the various parts of the group, subject to a working error of from ½ to ¾ of 1 per cent. only, are :—

Centre of cove through great circle to centre of north-east circle = 14 diameters of north-east circle.

Centre of great circle to Hauteville's Quoit = 5 diameters of the great circle, or 19 diameters of the north-east circle, the latter being the Metonic cycle number.

Centre of south-west circle through great circle to Hauteville's Quoit = 7 diameters of the great circle.

Centre of great circle to two stones too far to the west to be shown on the plan in NATURE = 9 diameters of the great circle.

With the exception of the last, anyone can test these proportionate distances by the plan given in NATURE, but who will tell us what was the meaning or object of them?

A. L. LEWIS.

ALCOHOL IN INDUSTRY.

THE committee, consisting of Sir Henry Primrose, K.C.B. (chairman), Sir W. Holland, M.P., Mr. J. Scott-Montagu, M.P., Sir William Crookes, Mr. Lothian Nicholson, Dr. Somerville, of the Board of Agriculture, Dr. Thorpe, the director of the Government Laboratories, and Mr. Thomas Tyrer, appointed last autumn by the Chancellor of the Exchequer to inquire into the use of duty-free alcohol in the arts and manufactures have got together their evidence and published their report with commendable promptitude. The report, we are glad to find, is unanimous, and this unanimity has doubtless not been without its influence in accelerating the business of the committee and the appearance of their report.

The subject, as was to be anticipated, has not been without its difficulties, for, as the committee state, a duty that yields more than twenty millions a year is a public interest that cannot be trifled with; but, as usual when men are determined to find a solution, it is remarkable how purely academic difficulties tend to disappear. Now that the suggestions of the committee are before us, the wonder is that they should not have been given effect to a quarter of a century ago. We are afraid the delay does not reflect creditably upon the enterprise, energy, or constructive ability of the numerous groups of manufacturers who are interested in obtaining the greatest possible facilities in the use of duty-free alcohol in the arts. This attitude of *laissez-faire* is seen, and commented upon by the committee, in connection with the apathy and general ignorance of manufacturers with respect to the provisions of Section 8 of the Finance Act of 1902, which gave the commissioners of Inland Revenue large discretionary powers as regards the use of spirit for industrial purposes. The committee point out that advantage has not been taken of the Act to the extent that might have been anticipated, and they have been surprised to find in examining the witnesses sent by the various Chambers of Commerce, who certainly ought to have had official knowledge of its existence, how very inadequate has been their acquaintance with its provisions.

In view of this general indifference one is tempted to inquire whether the manufacturers have had any real grievance, since they have made so little individual or collective effort to remove it. There is certainly no evidence that any collective effort has been made in the past, or, if it had been made, that the Treasury or the Revenue authorities would not have sympathised with it. The Exchequer, at all events since 1855, when the present system of denaturing spirit came into existence, may be said to have disclaimed any idea of collecting a revenue on alcohol used solely as a raw material and for purely industrial purposes. If the hitherto existing system of denaturing and control had proved so irksome that the development of chemical industry was impossible, it might have been supposed that Parliament would have been troubled with the question long ago. But as an actual fact the languid interest of the chemical manufacturers needed, apparently, to be supplemented by the quickening influence of the internal-combustion engine, and the possible applications of spirit as a motor-fuel supplied to a jaded House of Commons engaged in the discussion of a Finance Bill that stimulus which was necessary to secure from the Chancellor the promise of the departmental inquiry, which it would seem the great body of manufacturing chemists was too lukewarm to ask for.

Great cry has been made in the past that the hindrances to a free and untrammelled supply of alcohol have cost us the coal-tar dye industry, which originated in this country, and at one time flourished here; but the committee apparently have had little difficulty in ascertaining how "little wool" there is in this cry. They say they are satisfied that the assertion, as a statement of historical fact, is destitute of substantial foundation. In their opinion the main cause which led to the decadence of the industry in this country is that which we have repeatedly insisted on in these columns, viz. the failure of those responsible for the management and for the finance of the industry here during the years 1860–1880 to realise the vital importance of its scientific side, and their consequent omission to provide adequately for its development on that side.

It is true, however, that after signing the report, the two Members of Parliament named were induced to modify their assent to the unanimous finding of the committee as to the real cause of the decline of the coal-tar dye industry in this country. It will be interesting to see from the evidence, when this is published, what support Sir William Holland and Mr. John Scott-Montagu are able to find for the view they express in their letter to the Chancellor.

In reality, "alcohol" plays a very small part in

that industry, and of this "alcohol" methyl alcohol is the most important variety. Large classes of the coal-tar colours—alizarin, indigo, and by far the greater number of the azo dyes—require no spirit at all in their manufacture either directly or indirectly, and these represent the larger proportion of all the colours produced. It is perfectly certain that for at least 75 per cent. of the whole output of coal-tar dyes alcohol does not enter into account even now, and therefore whatever causes may have hindered the prosecution of the industry in this country, the question of "alcohol" is not one of them.

Although it has destroyed some illusions, corrected many misstatements, and, as in this example of the coal-tar colour industry, set many matters in their true perspective, the report is eminently constructive in character. To what extent the representations of manufacturers have actually aided the committee in formulating their main suggestions remains to be seen, as the evidence has not yet been published.

These recommendations are as follows:—

(1) That an allowance be granted to all industrial spirit, whether of British or foreign origin, at the rate from time to time prevailing for the allowance to British plain spirits on exportation.

(2) That imported methylic alcohol be relieved from the obligation to pay the surtax imposed by the proviso to Section 8 of the Finance Act, 1902, and that methylic alcohol be accorded favourable treatment in the matter of denaturing.

(3) That "ordinary," *i.e.* unmineralised, methylated spirit should contain only 5 per cent. of wood-naphtha instead of 10 per cent. as now.

(4) That no charge should be made on manufacturers for the regular attendance of Excise officers to supervise denaturing operations or the use of denatured spirit, in factories taking the benefit of Section 8 of the Finance Act, 1902.

(5) That where spirit is allowed to be denatured with special agents, such agents should be subject to official test and approved, and that accounts should be kept by the user showing receipts of spirit into store, the issues thereof from store in detail, and the quantities of the goods produced.

(6) That in the manufacture of fine chemicals and pharmaceutical products, spirit specially denatured should be allowed only where the manufacture is kept entirely separate from the manufacture of tinctures and other preparations in which spirit remains as spirit in the finished product.

(7) That the regulations governing the sale by retail of "mineralised" methylated spirit should be made less stringent and more elastic.

The committee are of opinion that any special cases not touched by the above recommendations can always be met under the powers conferred by Section 8 of the Act of 1902. This Act provides adequate and entirely satisfactory machinery for securing that the spirit may be used in a condition that is suitable and appropriate to each particular purpose of manufacture. The machinery is elastic—much more so than is the corresponding machinery in Germany—and it permits of every reasonable process of denaturing, or even in the last resort of the use of spirit in a pure state. For more than this it would be impossible to ask.

The committee believe that their recommendations, if adopted, will place the manufacturers of this country in respect of the use of alcohol in industry on a footing of equality, in some respects of advantage, as compared with their competitors abroad. Amongst the witnesses who appeared before them they found a very general impression that in Germany, at any rate—and Germany is always alleged to be our most formidable competitor—spirit could be used in manufacture duty-free and pure with scarcely any restraint. This, too, is one of the illusions which the inquiry may serve to dispel. As an actual fact, in practically all cases, with the exception of that of smokeless powder, in Germany duty-paid spirit must be used unless the spirit be subjected to some authorised process of denaturing prior to use. As regards price, and that is the principal factor, the committee think that the grant of the export allowance would make the average price of industrial spirit in the United Kingdom even lower than the average price in Germany. The price here, exclusive of the cost of any denaturing, and this denaturing may be what is called *ad hoc*—that is, dependent upon the use of something which is necessary to the manufacture—would be about 7*d.* the *proof* gallon, or about 11½*d.* the bulk gallon at 64 over proof—the strength common in industrial spirit. That is as low as the minimum price paid by users in Germany in 1902, when spirit was abnormally cheap, and is much below the figures of 15½*d.* per proof gallon, or 25½*d.* per bulk gallon, prevailing in Germany at the present time. Further, it is important to remember that the price of spirit in this country, where all materials may be freely used, and where none of general use is subject to taxation, is a stable price. In Germany the conditions of production are largely artificial and of very doubtful economic soundness, and they tend to wide and rapid fluctuations in price.

The main report is supplemented by a valuable report by the chairman, Sir Henry Primrose, and Dr. Thorpe, the principal of the Government Laboratories, on the working of the spirit regulations in Germany, based upon personal inquiry and observation in that country. So much stress was laid by certain witnesses upon the system and regulations established in Germany in connection with the industrial use of alcohol that it was thought very desirable to procure information at first hand upon that subject. This report may, it is hoped, serve to correct much misapprehension which appears to exist upon the benefits of State-aided alcohol in Germany. There is ample proof that the German user of spirit is not greatly benefited by the policy which the agrarian party has succeeded in fixing upon him, and is, indeed, at times greatly injured by it.

In reply to a question asked in the House of Commons on Tuesday, the Chancellor of the Exchequer announced that he has decided to deal with the subject of the committee's report in an omnibus Bill which he will introduce to the House, and not in the Budget and Finance Bill as originally proposed.

THE CAPITAL OF TIBET.[1]

ALL who have read in the columns of the *Times* about the mission to Lhasa will welcome in a more concrete form the story as re-told by Mr. Landon in the two handsome volumes now given to the public. In an expedition carried out under such conditions as those which governed Colonel Younghusband's mission, the special correspondent becomes a distinct factor in its success. The working men of the party, even if they have eyes to see and the rare gift of recording their impressions faithfully, can but present such generalisations as may be gathered during the few intervals hastily snatched from the worries and anxieties incidental to the routine of an abnormal state of existence. Usually they see but little, and that little from the restricted standpoint of their own idiosyncrasies.

[1] "Lhasa; an Account of the Country and People of Central Tibet, &c." By Perceval Landon. Vol. i. Pp. xix+414. Vol. ii. Pp. xi+426. (London: Hurst and Blackett, 1905.) Price 42*s.* net.

There is no lack of literature dealing with Tibet, literature dating from the early Jesuit and Capuchin friars of the seventeenth and eighteenth centuries to the latter-day expeditions of the native explorers of the Indian Survey, to whose marvellous performances in the field Mr. Landon is about the first writer to do passing justice; but we have never yet had an intelligent and accurate representation of the social existence of the people, nor a careful exposition of the weird eccentricities of that extraordinary anachronism, the Government of Tibet, at all comparable to that which Mr. Landon now gives us. Nor is this all. The enthusiasm of the true explorer pervades the book; that nameless joy in treading new and untouched fields; that absorbing interest in the aspects of nature, in its lights and shadows, fields and flowers, outline and colour; aspects which enchain the imagination everywhere, but acquire fresher value and larger interest the farther they are removed from the area of the well trodden world. Certainly there must be many more beautiful landscapes than those of the southern valleys of Tibet, the beauty of which exists, so to speak, in scraps—large scraps, perhaps, but scraps that are separated by wide intervening spaces of stony desolation and dreary outlook. Yet many of the best pages of the book are full to the brim with vivid descriptions of the beauty of Tibetan scenery as Mr. Landon saw it in the basin of the Brahmaputra River.

The illustrations are excellent, and there is an added value to them in the notes which are appended indicating the general tones and local colour of each view. If Mr. Landon has invented this method of recording the principal charm of Tibetan scenery for the benefit of those who know not Tibet, he is much to be congratulated thereon. All who know and love the Himalayas can fill up the pictures with the grace of nature's colouring from Mr. Landon's description alone, although here and there his colour notes are perhaps a little indefinite. What, for instance, are "lightning greys"? But where colour reproduction has not been left to the reader's imagination, and has been attempted by some process of block printing, the results are not so satisfactory. The distances are hard and obtrusive, and atmosphere has vanished from the view. Even in Tibetan highlands there is a certain amount of atmospheric influence, however thin it may be, which affects one's appreciation of distance.

To the great majority of readers Mr. Landon's descriptions of the beauty of the Brahmaputra valley to the south of Lhasa, of the glory of Tibetan sunsets, of the splendour of the Turquoise Lake set in the midst of the flower-strewn plain, of the vast impressiveness of the isolated city of mystery itself as it bursts on the view from a mountain-ringed depression beyond the Potala—the guardian sanctuary of its western gates—all these things will be just as new and as surprising as are the kindly amiability of its half barbarous people and the friendliness of disposition which they evinced towards the foreigner. Not that Mr. Landon is unduly optimistic. The extraordinary contrasts between barbarous magnificence and indescribable filth and squalor are not missed. Where the sweet scent and brightness of English flowers is noted as a passing incident there is no lack of intimation as to the nature of the rotting filth from which they spring. The interior of temples and dwelling houses, described as often impressive in its magnificence, and always surprising in the character of its artistic decoration, involves an approach through knee-deep slush and mud, terminating in the ascent of a greasy stairway

FIG. 1.—Part of the Potala Palace from the buildings at its base. It is built of granite and whitewashed once a year. The dark central portion is crimson. From Landon's "Lhasa."

foul with the accumulation of rancid butter and poisonous forms of putrid filth.

Animate nature in Tibet is no better than inanimate. We will pass by the pigs and the dogs, and refer only to the people. It was discovered by the medical staff of the mission who attended to the wounded warriors of Guru that the natural complexion of the Tibetan was quite fair—as fair as that of any European, in spite of the fact that no soap is ever used. But to judge from the aspect of the Tibetan as he (or she) appears in the ordinary unclean garb of daily life, the general tint of the skin appears to be that of a well baked potato picked out from amongst the charred sticks of a burn-out bonfire. The children are pretty and remarkably affable, and the general unloveliness of their parents is due quite as much to dirt as to exposure to the rigorous climate.

The story of the advance of the mission through the tangled forests and over the bleak passes of Sikkim is well told. There is none of the reiteration of the guide book or of the monotony of the intelligence report in Mr. Landon's tale. He takes the reader with him through the narrow and slippery ways of Chumbi, over the Himalayan backbone (not so formidable as the Sikkim-Chumbi passes), down the gentle slope to Gyantse, with an ever-varied interest gathered from what is to be seen around him as he rides. Mountains and stone-strewn slopes, trees (where there are any), flowers, and the small things that become great in a land where vegetation barely exists, all are noted in their turn, whilst we happily miss the daily routine of military movement and the everlasting repetition of marching experiences. Only when we get to the fighting stage do we hear much about the little army which formed the escort; and then there is enough of incident to make a fascinating and lasting record of really great achievement.

Not the least interesting chapters of Mr. Landon's book are those which deal with the superficial aspects of lamaism, and the relation between the Tibetan hierarchy and our frontier politics. Tibet affords a notable example (if one were needed) of the degrading, stifling, destroying effects of a dominant priesthood on a country's developments. Between the lamaism of Tibet and the pure faith of early Buddhism there is indeed a great gulf fixed, and Mr. Landon is well within the mark when he describes modern lamaism as "sheer animistic devil worship." Yet he is quite ready to recognise the power and the strength which are gained by the lofty isolation—the stern aloofness of the head of the Tibetan Church; and he is probably correct in estimating the Dalai lama as being still the recognised head of the Tibetan Church and State wherever he may be, at Urga or at Lhasa. Nor does he fail to reckon up the impressive effect of certain ceremonials, and the really awe-inspiring aspects of the temple interiors hallowed by the ever-dominating figures of the great "Master." Here we cannot quite follow him, for if his sketch of the head of the Great "Jo" in the holy of holies at Lhasa is realistic, the original can hardly be impressive.

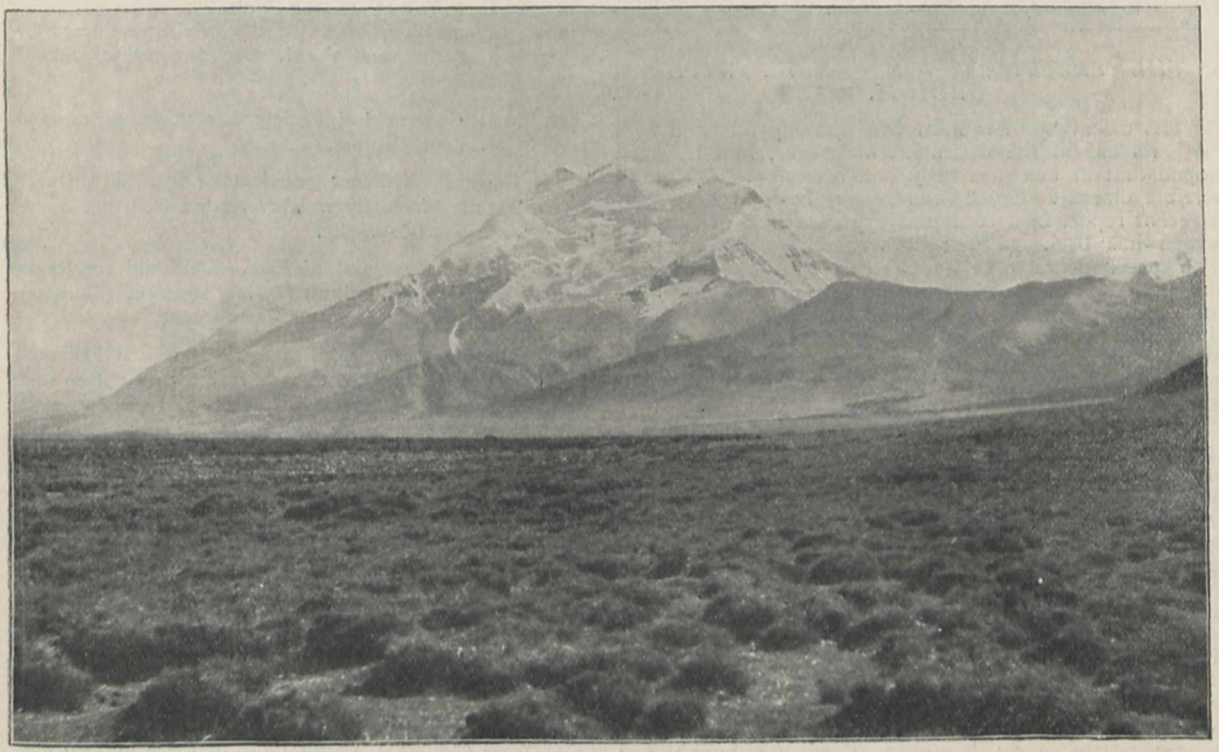


FIG. 2.—Nichi-kang-sang (24,000 feet). This peak guards the road to Lhasa over the Karo la. The track passes suddenly through the mountain barrier between the darker hill and the icefields of Nichi-kang-sang. From Landon's "Lhasa."

It will be news to most people that our Queen Victoria of blessed memory was, and is, a Tibetan incarnation, and is represented by a bloodthirsty blue goddess who revels in horrors such as would astonish even the gifted Kali of the Hindus. Yet she is regarded rather as a beneficent and protective goddess than a malignant one. This is encouraging, for it shows that something at least of the world-wide veneration that surrounded our ever-loved Queen had filtered through the almost impenetrable armour of lamaistic isolation. The Tsar has only recently been canonised, so to speak, on Dorjieff's recommendation.

As a recent incarnation, or "last-joined" saint, he invested the Dalai lama with a complete suit of bishop's canonicals. Perhaps this recognition of a certain analogy between the two Governments is not quite so inappropriate as it at first appears.

Mr. Landon concludes his delightful book with an expression of his opinion that the doors of Lhasa are once again closed to the European. Not again (according to our author) for many a long year will any Englishman watch for the flashing cupolas of the Potala from the banks of the Kyi Chu, or penetrate into the inner sanctuary of the everlasting Jo. With this view of the future of Tibet we can hardly agree. By his own showing there is quite enough of uncertainty, even in the present political situation, to warrant the making of a straight road over the Himalayan passes with as little delay as possible; and it should not be forgotten that the right of way to Gyantse is already secured. T. H. H.

THE TREATMENT OF CANCER WITH RADIUM.

THE discovery of radium was speedily followed by its use in the treatment of cancer, and it was hoped that at last a remedy had been found for this terrible disease. Great interest has been aroused by a recent report in a contemporary of a case of cancer which has been successfully treated by this agent. The case appears to be undoubtedly one of cancer, as the patient was carefully examined before, during, and after treatment by competent authorities; but the report of cure must be accepted with caution. We are informed that the treatment began in March, 1904, and although the disease has now disappeared, it is still possible that it may recur.

A very large number of cases of cancer have been treated by radium in this country, on the Continent, and in America. Some have improved remarkably, but in most instances there has been no apparent benefit, and in no case has sufficient time elapsed to speak with certainty of cure. No surgeon would feel justified in reporting a cure of cancer until at least two years had passed without recurrence, and there are many instances on record where a longer period of apparent immunity has been followed by a reappearance of the disease.

It must be remembered that the effect of radium upon a cancerous growth is, so far as we are at present aware, purely local. The terrible feature of cancer is the early involvement of the lymphatic glands, followed by the formation of secondary tumours in the internal organs. It is impossible to follow these internal developments by such a remedy as radium. Only too often a patient is found, on first seeking medical advice, to have already these secondary deposits, and treatment by local measures is purely palliative. That relief may be afforded in some cases which are beyond operation is recognised, but nothing has yet been reported which will warrant a surgeon using radium in a case of cancer where there is a possibility of complete removal by the knife.

Radium is applied in small tubes to the surface of a tumour, and in some cases it has been found possible to place it in the interior of a growth through a small incision. The quantities available are so minute that only a small area can be treated at one time. In the case of cancer mentioned above, the quantity which was used was ten milligrams. Fortunately the radium can be used again and again, for its energy appears practically to be inexhaustible.

NOTES.

SINCE the appearance in NATURE of April 6 of an article on the proposed amalgamation of the Society of Arts and the London Institution, a meeting of the proprietors of the London Institution has been held to consider the managers' proposals in connection with the amalgamation. The proposals met with a determined opposition from some proprietors; and after a somewhat noisy and undignified discussion, it was resolved to defer the further consideration of the scheme of amalgamation until after the annual meeting of the London Institution on April 28. The result of this meeting is to be regretted, since it implies the loss for the present of an excellent opportunity to accomplish the establishment of an important and powerful institute designed to develop a popular interest and regard for scientific work and results. It is to be hoped that it may prove possible to arrive at some agreement which will lead to the formation of a vigorous scientific organisation, in which the privileges offered by the Society of Arts and the London Institution will be combined.

THE Paris Geographical Society has awarded its gold medal to M. Paul Doumer.

IT is intended, if found practicable, says the *Pioneer Mail*, to arrange for daily weather reports from the Andamans by wireless telegraphy.

THE death is announced of Prof. A. Piccini, professor of chemistry at the R. Istituto di Studi superiori, Florence, and author of several works on chemistry.

THE President of the Board of Agriculture and Fisheries has appointed a committee to inquire into the nature and causes of grouse disease, and to report whether any, and, if so, what, preventive or remedial measures can with advantage be taken with respect to it.

THE Paris correspondent of the *Times* announces the death of Colonel Renard, the director of the National Aërostatic Park at Meudon. The investigations and experiments of the Renard brothers have done much to promote the progress of aërial navigation.

IT is announced that the Liége International Exhibition will be opened on Saturday, April 22, and that, unlike most exhibitions, the buildings will be complete. The exhibition will be of a very attractive and picturesque character, and the buildings cover a greater area than at any previous exhibition, except those of Paris in 1900 and of St. Louis. During the period of the exhibition several congresses will be held in Liége, that of mining and metallurgy, from June 26 to July 1, promising to be the most largely attended.

THE *Times* correspondent at Athens states that at the last meeting of the Archæological Congress, on April 13, it was decided that the present executive committee should continue to exist until the next meeting of the congress, which was fixed to take place at Cairo after a *minimum* interval of two years, the Egyptian Government having signified its willingness to accept this arrangement.

PRESS telegrams from Martinique report that Mont Pelée is again showing volcanic activity. On April 9–10 the escape of vapour was fairly abundant. On April 10–11 a marked recrudescence manifested itself; numerous small clouds issued from the vent, and there was a small flow of lava into the valley of the White River. On April 13–14 frequent rumblings were heard, and it was noticed that blocks of rock, accompanied by white clouds, were expelled from the south side of the crater.

MR. C. H. HAMILTON records in *Science* that the world-renowned volcano Kilauea, in the Hawaiian Islands, has again become active, after a rest of thirteen years. Fresh lava appeared the last week of February, heralded by a slight earthquake. On March 10 the Volcano House reported the existence of a large lake of lava. "Heavy rumblings and explosions indicate that another outbreak is imminent." Thus there seems to be a restoration of the old-time activity—such as will cause a large increase in the number of visitors.

DR. DAVISON states in a letter to the *Times* that a detailed record of the Indian earthquake was given by a horizontal pendulum at Birmingham. The first tremors were registered at 1h. 6m. 18s. a.m., and were succeeded at 1h. 29m. 2s. by long-period undulations lasting for more than an hour and a half. The more prominent of these undulations were in two series, separated by a few minutes, and little more than two hours later the diagram showed another double group of waves. The early tremors took a direct course through the body of the earth; the first double series travelled along the surface by the shortest way to Birmingham, while the second double series followed the longest possible route, through the antipodes, and back again to Birmingham.

IT is announced in *Science* that Dr. Frank Schlesinger has been elected director of the New Allegheny Observatory. The observatory has an endowment fund, and a regular income from the time service, besides owning a large and valuable property in the City of Allegheny, which will become a source of income in the near future. Work has not been suspended on account of lack of funds, and much has been accomplished toward the instrumental equipment during the past year. The Keeler memorial telescope of 30-inch aperture is now ready to be set up, and the large (Porter) spectroheliograph is almost completed. The 30-inch objective is well under way, and other instruments will be installed during the year under the directorate of Dr. Schlesinger.

AT the meeting of the Royal Colonial Institute, held on April 11, Sir Frederick Pollock read a paper on Imperial Organisation. He deprecated the national faculty of compromise, and asked, could we go on trusting to compromises and accidents? It is necessary to look, he continued, for some plan which will avoid elaborate legislature and formal change in the Constitution. We must be content for the present with a council of advice which will have only "persuasive authority." A permanent secretary's office is required, independent of any existing department, but immediately under the president of the Imperial council. The best living information ought to be at the service of this Imperial council through its secretariat; and this can be most effectively done, without ostentation and with very little expense, by the constitution of a permanent Imperial commission the members of which will represent all branches of knowledge and research, outside the art of war, most likely to be profitable in Imperial affairs. Not only learned and official persons would be included in such a body, but men of widespread business, travellers, ethnologists, comparative students of politics might all find scope for excellent work. It need not be paid work. It would be as willingly done without pecuniary reward as the more formal and laborious work of Royal Commissions, as to which there has never been any difficulty. Of the need for some such advisory council to secure national efficiency there can be no doubt, and it is earnestly to be desired that hopes and schemes, like that of Sir F. Pollock, will soon fructify in accomplished fact. A select advisory council on which men of science familiar with the scientific advances of recent years took a prominent place would assist statesmen to secure national efficiency more than any other expedient.

REPORTS of the annual general meeting of the Chemical Society and of the anniversary dinner are given in the *Proceedings* of the society, just issued. The following extracts from the official account of remarks made at the dinner by Mr. R. B. Haldane, as to the neglect of science by the British nation in the past, and the promise of an improved position in the future, are of interest:—The problem which lay in front of the British nation was how to develop what he might call the grey matter of the executive brain. All the things spoken of that night represented something new in the nation, and not only something new, but something of which they would have to see a great deal more if the nation was to hold its own in these days. Science counted for more than ever it did. The West had had a rude awakening at the hands of the East. The controversies which agitated the minds of politicians were of less importance than the great question of how to make the permanent element in politics more powerful and better than it was. There was too little science in the present day, although one or two things had been done for which they were very grateful, in connection with the Navy and the Army and the Defence Committee. If they turned to the different departments of the Government there was hardly one which did not require science, if its policy was to be an effective policy. Wherever they turned science was needed, and yet there was not sufficient attraction to a man of high attainments to put himself at the disposition of the State. Foreign Governments held out careers far in excess of any rewards and honours which the British Government could afford. Was it impossible to see an era in which the head of the Government could have at his disposition the first intelligence and the best brains which the nation could command? If we were to hold our own we must not be behind Berlin, the United States, or the French nation. Science never stands still, and if science does not stand still, Governments cannot afford to stand still in their use of science. These were speculations which, perhaps, went beyond the moment, but he had a strong feeling that the time was very nearly, if not quite, ripe for them. They would see what was the mind of the nation on this point, and doubtless they would be subjected to the acute disappointment to which all were usually subjected when they formed great expectations. He hoped to see the position of science raised in the next few years, and he looked to the time when brute force would count for little, and knowledge for more.

WE have received from Messrs. R. Friedländer and Sons, of Berlin, a priced catalogue of books and papers dealing with vertebrate anatomy and physiology.

PART xxxi. of the *Transactions* of the Yorkshire Naturalists' Union contains the reports of that body for the years 1903 and 1904, and also a reprint of the excursion circulars for the same period. A satisfactory feature in the work of the union is the care devoted to the collection of photographs of important geological sections within its sphere of influence.

PROF. J. S. KINGSLEY discusses in the February number of the *American Naturalist* the current nomenclature and homology of the component bones of the lower jaw of reptiles, pointing out that there is still some uncertainty with regard to the proper determination of one of these

elements in crocodiles. The other articles are on natural and artificial parthenogenesis, by Dr. A. Petrunkevitch; on the angle of deviation from the vertical at which stems show the strongest geotropical response, by Miss Haynes; and on the variation in the ray-flowers of Rudbeckia, by Dr. R. Pearl.

IN the April number of *Bird Notes and News* reference is made to certain common misapprehensions in regard to the authorities responsible for protective regulations, and it is pointed out that many of these emanate from county councils. To the agriculturist and the horticulturist it is, however, of little consequence whether the alleged over-protection of birds in his particular district is the work of the local or of the Imperial Parliament, for the difficulty of getting ordinances repealed appears as difficult in the one case as in the other. In the statement on p. 61 as to the sale of skins of "Argus pheasants from the Himalayas," it should have been pointed out that "Argus pheasant" is the trade name for the peacock pheasants (Euplocamus) of the Himalaya, the true Argus having a very different habitat.

THE following quotation in the February issue of the *American Naturalist* from a work by Messrs. Gilbert and Starks on the fishes of the two sides of the Isthmus of Panama has a very great interest from the point of view of distribution in general:—"The ichthyological evidence is overwhelmingly in favour of the existence of a former open communication between the two oceans, which must have become closed at a period sufficiently remote from the present to have permitted the specific differentiation of a very large majority of the forms involved. . . . All evidence concurs in fixing the date of that connection at some time prior to the Pleistocene, probably in the early Miocene." This agrees precisely with the conclusions drawn from the study of the fossil mammalian faunas of North and South America, which indicate that land communication between those two continents was interrupted during a considerable portion of the Tertiary epoch, and only re-established about the close of the Miocene or early part of the Pliocene epoch.

THE existence of an entirely distinct second family type of lancelets (Cephalochordata) is demonstrated by Dr. R. Goldschmidt in *Biol. Centralblatt* of April 1. It appears that in 1889 Dr. A. Günther described a lancelet obtained during the *Challenger* Expedition as a new species, under the name of *Branchiostoma pelagicum*, its special characteristic being the absence of a tentacle-apparatus. Although on this ground Gill proposed the new generic name Amphioxides in 1895, while Delage and Hérouard pointed out that if the character in question was not due to imperfection the creature indicated a distinct ordinal type, yet it has generally been allowed to remain in the type genus, as in Prof. Herdman's account of the group in the "Cambridge Natural History." The examination of twenty-six entire specimens obtained during the recent German deep-sea expedition enables Dr. Goldschmidt to state that *A. pelagicus*, together with two closely allied species, represents a distinct family of Cephalochordata, which may be distinguished from the typical family as follows:—Family Branchiostomatidæ.—A peribranchial space; the ventrally-opening mouth surrounded by tentacles; gill-canal furnished throughout its diameter with lateral gill-slits. Family Amphioxididæ.—No peribranchial space; the slit-like mouth opening on the left side; gill-slits situated in the ventral median line; gill-canal divided into a dorsal nutritive and a ventral respiratory half.

Indian Public Health for March (vol. i. No. 8) contains articles on septic tank installations in Bengal, sewage disposal in India, Hankin's views on plague epidemiology, the Finsen method, &c.

IN the *Revue scientifique* (April 8) M. Calmette, the director of the Pasteur Institute, Lille, writes on the important *rôle* played by medical science in the successful colonisation of tropical countries, instancing such diseases as cholera, leprosy, plague, and malaria, which can be robbed of their terrors only by the institution of efficient sanitary control in the districts in which they occur.

MAJOR RONALD ROSS, F.R.S., in a letter to the *Times* (April 7) directs attention to the remarkable diminution in malarial disease which has accompanied the institution of anti-mosquito measures at Klang and Port Swettenham in the Federated Malay States. The former, with a population of 3576, and the latter of about 700, were both perfect hotbeds of malaria, and in 1901, for the two towns, 236 sick certificates and 1026 days of leave were granted. In 1902, after anti-mosquito measures had been energetically pursued, the figures were 40 and 198, and in 1904 these had further fallen to 14 and 71 respectively. Dr. Malcolm Watson, district surgeon, from whose report these statistics are taken, sums up by saying:—"In whatever direction one turns, it is plain that the two areas which were so malarious in 1901 are now practically, if not absolutely, free from the disease, and that the district surrounding these two areas remains much as it was." These anti-mosquito measures were initiated by the Department for Medical Research, Federated Malay States (which is affiliated with the London School of Tropical Medicine), under the direction of Dr. Hamilton Wright.

IN a short paper which appeared in the *Botanical Gazette* (February) Mr. C. H. Chamberlain advances the opinion that an alternation of generations as understood by botanists for plants can be recognised in animals. The egg with the three polar bodies constitutes a generation comparable with the female gametophyte in plants; similarly, the primary spermatocyte with the four spermatozoa constitute a generation comparable with the male gametophyte in plants. All other cells of the animal constitute a generation comparable with the sporophytic generation in plants.

TWO debated points connected with the problems of geotropism in plants, *i.e.* the seat of geotropic sensibility, and the statolith theory simultaneously advanced by Haberlandt and Němec, form the subject of a critical review by Dr. Linsbauer, who writes in *Naturwissenschaftliche Wochenschrift* (March, No. 11). The reviewer may be regarded as an adherent to the statolith theory, and notes that although the *rôle* of statoliths is generally attributed to starch grains, in their absence other bodies, such as crystals of calcium oxalate, or certain bright bodies found in the rhizoids of Chara, may function similarly.

THE *Bulletin* of the American Geographical Society contains an article on the work of the Reclamation Service of the United States, by Mr. C. J. Blanchard. During the last three and a half years a sum of nearly twenty-five million dollars has been realised from the sale of public lands, and work has been begun on eight irrigation projects which will make an area of about one million acres productive. The *National Geographic Magazine* for March has a short article, with excellent illustrations, on the same subject.

MESSRS. W. STANFORD AND CO., of Oxford, have sent us specimens of a number of outline maps of the world, on Mollweide's equal-area projection; also a map of the Atlantic Ocean, on the same projection. The maps are well drawn and clearly printed; the larger scale maps should be extremely useful for purposes of research and teaching, while the smaller maps are well adapted for museum use. The employment of equal-area maps in representing distribution cannot be too strongly recommended, and in providing such maps at very moderate prices Messrs. Stanford have done good service.

IN ore-dressing operations and in laboratory work much confusion is caused by the practice of describing the sieve or screen employed by the number of the mesh. A sieve of 30 mesh, for example, does not possess an aperture of one-thirtieth of an inch, nor does it yield a product of which the largest particles will be one-thirtieth of an inch in diameter. With coarse sieves the error is not of great moment, but with fine sieves the wire itself occupies so much space that the size of the particle passed by the sieve may vary from a quarter to two-thirds of the size indicated by the word "mesh." Consequently, in ordering wire screens or in recording results it is desirable to specify the size of aperture rather than the number of the mesh. In order to enable this to be done, Mr. G. T. Holloway has drawn up a valuable series of tables, calculated on the British Imperial Standard wire gauge, showing the size of aperture in screen wire cloth of all the principal sizes in use down to the very finest. The tables have been duplicated, one series showing the figures in decimals of an inch, and the other, for the use of those who still prefer to employ vulgar fractions, in both decimals and vulgar fractions. The tables, which have been published in pamphlet form (*Bulletin* No. 5 of the Institution of Mining and Metallurgy), have been calculated with great care, and should do much towards effecting uniformity in the nomenclature of sieve-mesh.

THE Geological Survey of Western Australia is publishing, in handy octavo form, a valuable series of bulletins, of which we have received three. One of them, dealing with the mineral production of the colony up to the end of 1903, is written by Mr. A. Gibb Maitland and Mr. C. F. V. Jackson. It shows that the total value of the mineral products was 47,779,000*l*., gold alone representing a value of 46,441,000*l*. Other minerals mined include copper, tin, lead, silver, iron, antimony and cobalt ores, coal, graphite, limestone, precious stone, mica, asbestos, and salt. In the other bulletins Mr. C. G. Gibson deals with the mineral resources of the Murchison goldfield and of Southern Cross, Yilgarn goldfield. The reports and the accompanying coloured maps throw much light on the geology of the districts, and indicate that the areas described deserve more attention from the mining prospector than they have hitherto received. The Murchison goldfield is of some historical interest in that in 1855, when its economic value was purely prospective, it was officially stated to have the appearance of being one of the finest goldfields in the world. Although it has not come up to these high expectations, it is one of the most important goldfields in the colony, and contains not only one of the largest quartz veins mined anywhere, but also the iron ore deposits of the Weld range, which, though practically valueless owing to their inaccessibility, are among the richest in the world.

MR. V. KOUSNETZOFF communicated to the *Bulletin* of the St. Petersburg Academy of Sciences of September last some useful formulæ for the determination of the height of aurora borealis. He also gave tabular and graphical results of its occurrence at Pavlovsk from January 1, 1878, to the end of 1903. The tables show, generally, an eleven years' period, as in the case of sun-spots, but the details of the two curves do not correspond. The maxima of the auroræ occurred in 1887 and 1896, and the minima in 1884 and 1894, but this divergence may be due to the occurrence of cloud. The annual period is well marked, the maxima being in March and October, and the minima in January and July.

IN the *Archives des Sciences physiques et naturelles* of March last M. F. A. Forel summarises his own observations and those made by others on the occurrence of Bishop's Ring, following the great volcanic eruption of Mont Pelée (Martinique) on May 8, 1902. Bishop's Ring, as most of our readers are aware, consists of a solar corona of great diameter; it appears to be formed of two parts, a limb of a dazzling silvery hue being immediately round the sun, and, beyond this, a coppery red ring of some 20°–25° exterior radius. The ring appears to have been first observed in the winter of 1902–3, but only became general towards the end of July, 1903, and was constantly seen until November of that year. After that time it became less frequent, and ceased altogether in July, 1904. The phenomenon is best seen from an elevated station, and when the sun is high above the horizon. The intensity of the colours of the ring was less than in that which followed the Krakatoa eruption in 1883.

Bulletin No. 35 of the United States Department of Agriculture, Weather Bureau, will be found of great interest to those who wish to know something about the present stage of long-range weather forecasting. The first chapter is written by Prof. Garriott, and presents a verification of the work of the most prominent of the so-called long-range weather forecasters in the United States. Prof. Garriott considers chapter and verse of the forecast with the actual facts, and shows conclusively the fallacy of these predictions. Prof. Woodward, in the second chapter, devotes his attention to the impossibility of basing weather predictions on planetary influences, and at the same time criticises the work of Mr. Tice embodied in a book on the elements of meteorology. Perhaps the most interesting portions of this *Bulletin* are the pages devoted to a discussion by Prof. Garriott of the subject of long-range forecasting by many of the leading meteorologists of the world. It may be said to be a brief review of the literature on the subject, and gives quotations of their opinions regarding the practicability of long-range work. At the end is given a summary of the remarks and opinions expressed and a series of conclusions based on them, and we refer the reader to the *Bulletin* for these conclusions. There is one which may be mentioned here, since by recent work in this country it has been brought prominently forward. "Advances in the period and accuracy of weather forecasts depend upon a more exact study and understanding of atmospheric pressure over great areas and a determination of the influences, probably solar, that are responsible for normal and abnormal distributions of atmospheric pressure over the earth's surface."

No. 3 of vol. ii. of *Le Radium* contains useful articles on uraniferous minerals and their deposits, and on the methods used in the measurement of the quantity of heat evolved by radio-active substances.

PROF. MCCLELLAND has recently shown that the emanation of radio-active substances does not carry an electrical charge, and the same conclusion is arrived at by means

of a different form of apparatus by Prof. Battelli and F. Maccarrone (*Physikalische Zeitschrift*, No. 6). It must be concluded, therefore, contrary to M. Becquerel's views, that such emanations consist neither of fragments of atoms which have lost positive ions nor of the positive ions themselves.

A NEW method for the preparation of paraffins from their monohalogen derivatives which is described by M. Paul Lebeau in the current number of the *Comptes rendus* (April 10), is noteworthy on account of the simplicity of the reaction and the purity of the gas obtained. Sodium is converted into sodium-ammonium by the action of liquid ammonia, and this, treated with methyl chloride, gives methane, readily obtained in a pure state by liquefaction by means of liquid air. Ethyl and propyl iodides react with the same ease, giving rise to ethane and propane, the purity of which was verified by combustion analysis. It is pointed out by M. Lebeau that as these reactions take place below the boiling point of liquid ammonia there is small probability of any secondary reactions taking place.

THE current number of the *Quarterly Review* contains an article by Mr. A. E. Shipley on "Pearls and Parasites."

WE have received from Messrs. Isenthal and Co. a well illustrated and conveniently arranged catalogue of technical and laboratory electric measuring instruments and rheostats.

THE issue of the *Journal* of the Royal Sanitary Institute for April contains a full account of the papers read and the speeches delivered at the conference on school hygiene held at the University of London in February last, and reported in NATURE for February 16 (p. 377).

MANY characteristic scenes of the western coast and fjords of Norway are described and illustrated in a pamphlet just issued by the Albion Steamship Co., Ltd., Newcastle-on-Tyne, as an itinerary of cruises to be taken this year by the yachting steamer *Midnight Sun*.

MESSRS. JOHN J. GRIFFIN AND SONS, LTD., have published a ninth edition of their illustrated and descriptive catalogue dealing with apparatus suitable for the practical study of sound, light, and heat. An examination of the contents of the catalogue shows that a great improvement is taking place in the apparatus employed in the laboratories and lecture-rooms where physics is taught. Teachers and others should find this catalogue helpful and suggestive.

OUR ASTRONOMICAL COLUMN.

ASTROPHYSICAL WORK AT THE SMITHSONIAN INSTITUTION.—Prof. Langley's report of the work performed in the various departments of the Smithsonian Institution during the year ending June 30, 1904, contains a report by Mr. C. G. Abbot of the observations made in connection with the solar radiation at the astrophysical observatory.

Among many items of interest, the following may be briefly mentioned:—The bolometer apparatus has now been improved to such a state of perfection that a duplicate set for investigating the radiation of stars has been constructed. A series of experiments with the improved pyroheliometer has shown that this instrument may now be used with confidence to measure the solar radiation.

The definition of the long focus mirror has been considerably improved by churning the air inside the tube, by protecting the tube from the direct solar rays with a covering of canvas, by employing a number of supporting plates as suggested by Prof. Ritchey in order to preserve the shapes of the mirrors, and by nullifying the vibrations due to traffic by placing indiarubber pads behind the mirrors. Prior to these alterations the solar image was ill-defined; different parts of it came in focus in different planes, whilst the variation in the focal length of the instrument often amounted to 10 feet during a single day. Now the image is much better defined; all parts of it are focused in the same plane, and the focal length never varies so much as 12 inches during a day.

Well marked variations, amounting to 10 per cent. of the total, have been recorded in the value of the solar radiation, and Mr. Abbot expresses a strong hope that, on combining the solar radiation and atmospheric transparency results, long range climate forecasting will ere long become possible.

VALUE OF THE ASTRONOMICAL REFRACTION CONSTANT.—The third volume of the *Publications* of the Granducal Observatory at Heidelberg contains 234 pages devoted to the discussion of the results obtained by M. L. Courvoisier in a research undertaken by him for the determination of the refraction constant.

The instrument employed was a 6-inch Repsold meridian circle, which, together with its various constants, is described at length. Two hundred stars were observed, and the observations and their peculiar errors are discussed. The meteorological data for several periods during each observing day are next given, the observations extending from June 3, 1899, to July 9, 1901, and this table is followed by sections dealing with the stellar, latitude, and declination observations respectively.

The value obtained for the refraction constant is $60''{\cdot}161 \pm 0''{\cdot}037$.

REALITY OF VARIOUS FEATURES ON MARS.—In No. 4007 of the *Astronomische Nachrichten* Signor V. Cerulli, of Teramo, discusses the actual subjectivity of various Martian phenomena, as seen in the telescope, from a physiological standpoint. Having observed Mars regularly for ten years, he appears to have arrived at the conclusion that the actual existence of these features is as much a subject for physiological as for astronomical investigation. He states that the phenomena observed are so near to the limit of the range of the human eye that in observing them one really experiences effects accompanying "the birth of vision." That is to say, the eye sees more and more as it becomes accustomed, or strained, to the delicate markings, and thus the joining up of spots to form "canals" and the gemination of the latter follow as a physiological effect, and need not necessarily be subjective phenomena seen by the accustomed eye.

STONYHURST COLLEGE OBSERVATORY.—In addition to the results of the meteorological and magnetic observations made during 1904, Father Sidgreaves's annual report briefly refers to the solar and stellar spectroscopical work carried out at Stonyhurst during last year.

Two series of spectrograms of β Aurigæ and γ Cassiopeiæ were commenced, and the results already obtained are very promising. A short table showing sun-spot areas and the range of the magnetic declination appears to confirm the connection between these two values for the years 1898–1904. The spectra of sun-spots in the green and violet regions have been photographed with a Rowland grating spectroscope, and a number of experiments have been made with the view of photographing the spot spectra in the red region.

NATURE OF SUN-SPOTS.—In the April number of the *Bulletin de la Société astronomique de France* Abbé Th. Moreux re-discusses his theory concerning the formation and nature of sun-spots in the light of data more recently acquired, more especially during the great spot of February last. He gives numerous drawings of this spot, and several schematic diagrams showing the possible arrangement of the photospheric clouds in and over the spot, and arrives at the conclusion that spot areas are analogous to *anti-cyclonic* areas in the terrestrial atmosphere.

INSTRUCTIONS TO SOLAR OBSERVERS.—Amateur observers of solar phenomena will find the instructions to solar observers, formulated by the "commission solaire" of the Société astronomique de France, of great use and interest. Chapter v. is published in the April *Bulletin* of the society, and deals with daily spectroscopic observations of the chromosphere and prominences by the Lockyer-Janssen method.

RECENT CHANGES IN THE CRATER OF STROMBOLI.[1]

STROMBOLI is the most easterly and northerly of the Lipari Islands. It is situated north of Sicily, close to the track of steamers plying between Naples and the Straits of Messina, and is thus an object familiar to passengers to or from Egypt or the East, though comparatively few have landed on its shores. Its almost constant eruptions have gained it the name of the lighthouse of the Mediterranean. It is almost circular, as its old name Strongyle indicates, and rises as an irregular cone out of deep water. On the north-west side are the crater, and the Sciara or steep slope down which the ejecta roll into the sea.

FIG. 1.—Stromboli. The Sciara from the North-east.

The summit of the mountain, which is about 3000 feet high, consists of a crescentic ridge, the Serra di Vancori, open towards the north. It forms part of an old crater ring, and thus presents points of similarity to Somma. Inside the crescentic ridge, and in places joined to it by irregular crests of rock, but mainly separated from it by a valley, "A Fossieiedda," similar to the Atrio del Cavallo of Vesuvius, is another crescentric ridge, connected with the two extremities of which, and immediately overlooking the sides of the crater, are two conspicuous pointed rocks, the Torrelle, which partly obstruct the view of the crater when viewed from the cliffs overlooking the Sciara on its north-east and south-west respectively. These Torrelle, being practically unaltered by ordinary eruptions, present good points of comparison for estimating the changes that take place, and one or other of them is included in most of the photographs. Between the two Torrelle, in the midst of a sort of amphitheatre formed by them and the crescentic ridge last mentioned, are the crater and its appurtenances, the "Apparato Eruttivo" of Italian observers. This amphitheatre is open to the north-west, and from its open side beyond the craters the steep slope of the Sciara extends down into the sea. This slope is bounded on each side by two steep cliffs, Filo di Sciara and Filo di Baraona, which are formed, like the Sciara itself, of lava-streams, agglomerates, and dykes; in fact, of almost every kind of compact volcanic material, chiefly of basic composition.

This Sciara, as is well known, is one of the most peculiar features of this volcano. It extends at an angle of about 35°, which is the "angle of repose" for the kind of material of which it is composed, down into the deep water of the Mediterranean; and though the volcano has certainly been in almost constant eruption during the whole of the historic period, and probably much longer, it has never been able to build up a talus sufficient to rise to the level of the sea, much less to that of the lip of the crater, about which, according to the analogy of other volcanoes, it might have been expected to have built up a cone on this side comparable to the portion on the south described above. Fig. 1, from a photograph[1] taken by the author in 1888 from the ridge overlooking the north-east side of the Sciara, and consequently looking south-west, shows the Sciara extending down to the right of the picture with the Filo de Barcuna behind it. The pointed rock to the left of the picture is the eastern Torrella, with a gap to the left of it through which the ejecta are thrown during the larger eruptions, and roll on to the steep slopes in front and down the Sciara into the sea. The western Torrella is just visible in the distance beyond the eastern Torrella. The crater situated between the two was in 1888 a large pit obviously formed by severe explosions. It contained two small secondary cones. One, towards its western part, and close to the edge of the Sciara, was that from which the explosive eruptions took place several times an hour; the other, towards the eastern part, emitted only smoke.

FIG. 2.—Stromboli. The Sciara from the West.

[1] Abridged from a paper by Dr. Tempest Anderson in the *Geographical Journal* for February.

[1] From "Volcanic Studies," by Tempest Anderson, plate xxi.

In 1904, when the author took comparison photographs from nearly the same spot, this large crater was almost entirely filled up, and the slope of the Sciara was continued upwards, so that the cone of ejecta overtopped and was visible behind the eastern Torrella. The activity in this eastern part of the crater still maintained the same quiet character as in 1888. The whole area constantly emitted vapour; there was more than one bocca visible, but they were quite small and only gave very feeble explosions, and these with a rhythm quite independent of those at the western part of the crater.

Fig. 2, taken by the author on April 20, 1904, from a point to the west of the crater, and consequently in almost exactly an opposite direction to Fig. 1, shows the condition of the western part of the crater sixteen years later. The conspicuous rock to the right of the plate is the western Torrella, behind which, in 1888, was the great crater above referred to. The bocca to the left, from which the explosion is taking place, is shown in some of the earlier photographs as situated on the edge of the large crater at its junction with the Sciara. The great crater is now seen to be filled up by ejecta which prolong the slope of the Sciara upwards over what was previously its site, while the bocca itself remains in all probability really in its former position, though apparently on the slope of the Sciara instead of on its edge.

It will be interesting to future visitors to see whether the volcano will continue to prolong the slope of the Sciara much further upwards, or whether a paroxysmal explosion will occur which will clear the great crater again.

The paper in the *Geographical Journal* is illustrated with twelve photographs and a map showing these and other points more in detail.

THE INSTITUTION OF NAVAL ARCHITECTS.

THE annual spring meeting of the Institution of Naval Architects was held last week, commencing on Wednesday, April 12, and being continued over the two following days. The president of the institution, the Right Hon. the Earl of Glasgow, occupied the chair. A very full programme had been arranged, there being no less than fifteen papers set down for reading and discussion, and there was also the presidential address.

The first business after the usual formal proceedings was the reading by the secretary, Mr. R. W. Dana, of the report of the council. By this it appeared that the institution is in a prosperous condition, both in regard to finance and membership. Reference was made to the proposed foundation of an experimental tank for the purpose of scientific investigation of problems connected with ship design. It will be remembered that it was proposed, at the initiative of Mr. A. F. Yarrow, Dr. Elgar, Sir William White, and other prominent members of the institution, that an institution tank should be founded in connection with the National Physical Laboratory. Such a tank, devoted to research of a scientific nature, would be of great benefit to the ship-building industry, and would do much to raise naval architecture to a higher plane by the substitution of scientific principles for those empirical methods upon which ship designers too largely have to rely. It is much to be regretted, therefore, and not very creditable to an important and wealthy industry, that the appeal made by the council of the institution has met with so poor a response. Only six thousand pounds out of the fifteen thousand pounds needed has been underwritten, so that the project is shelved for the present. In spite of the enormous preponderance of the ship-building interests of this country, there are but two experimental tanks in the kingdom. One is the property of the Government, and is devoted wholly to the Royal Navy, the other being the property of a private firm of ship-builders on the Clyde. Both these tanks are devoted entirely to what is known as "practical work," that is to say, they attack subjects piecemeal, and therefore in a more or less empirical fashion. They have no time for ordered investigation of fundamental principles, upon a knowledge of which, alone, can a useful superstructure of applied science be raised. The tanks are not to blame for this. They were established for a definite purpose, which they admirably fulfil.

In the presidential address Lord Glasgow, among other subjects, referred to the spread of the steam turbine for marine propulsion, alluding more particularly to the recent trials of H.M.S. *Amethyst*. Some interesting comparisons were made between the performances of this cruiser, which is fitted with steam turbines, and the *Topaze*, a similar ship in all respects, excepting that she has ordinary crank and cylinder engines. As is well known, the steam turbine is less "flexible," to use an expression that has come into use, than the reciprocating engine; that is to say, its efficiency falls off rapidly when it is run at lower powers than that for which it was designed to give maximum efficiency. This point was well illustrated during the trials of the *Amethyst* and the *Topaze* by the coal consumption, the figures being given in Lord Glasgow's address. The steam turbines of the *Amethyst* drove her at 23½ knots, 5·45 per cent. faster than her sister ships with reciprocating engines. At the higher speeds the turbine engines appeared decidedly more economical; at lower speeds the reciprocating engines had the advantage. At 10 knots a ton of coal would carry the *Amethyst* 7·42 miles, or the *Topaze* 9·75 miles. From this speed upwards the margin in favour of the reciprocating engines decreased, until the consumption curves would cross at a little above 14 knots, when approximately 6½ miles would be steamed on a ton of coal. At a speed of 20 knots the *Amethyst* ran 4·22 miles, and the *Topaze* 2·9 miles, per ton of coal burnt. At 23·6 knots, a speed the *Topaze* did not reach, the *Amethyst* would steam a little more than 2 miles per ton of coal. If it may be allowed that about 14 knots is the lowest speed at which these cruisers could be advantageously run in time of war, the steam turbine has a marked advantage for warlike purposes; but it might lead to higher coal consumption in time of peace.

The first paper taken was a contribution by Mr. W. B. Smith, of the Admiralty, upon the design of the Antarctic exploration vessel *Discovery*. This was a single screw wooden steamer 175 feet long, 34 feet wide, and about 1620 tons displacement. The propeller was so arranged as to be disconnected from the shaft and lifted into a well, after the manner adopted in the old steam frigates. The rudder was also arranged to be readily unshipped. The scantling of the hull was massive, but in general plan followed the designs adopted in the days of wooden construction. The vessel was fully rigged as a barque. The fitting of a magnetic observatory was one of the special features of the design. The work done here was of great magnitude, and the observations taken are now being analysed by Captain Chetwynd, the Admiralty superintendent of compasses. No magnetic metal was allowed within a radius of 30 feet of the observatory. Main shrouds were of hemp, the lanyards being rove through wooden dead eyes. Great care was taken to lag the living part of the ship so as to economise coal. Professional details of the design were dealt with at some length. In the discussion on this paper, Sir Clements Markham gave some historical details of former Polar expeditions, and dwelt upon the advantage of having a ship expressly built for the purpose. Captain Scott, who was in charge of the expedition, Sir William White, and Admiral Fitzgerald also spoke.

The next paper was by Colonel Soliani, of the Royal Italian Navy, and gave technical details of the Japanese war vessels *Kasuga* and *Nisshiu*, both built in Italy. A paper by Mr. H. Rowell giving an account of the Russian Volunteer Fleet followed.

The second day of the meeting opened with a paper by Prof. J. H. Biles, who gave details of trials made to test the strength of a torpedo-boat destroyer supplied for the purpose by the Admiralty. The vessel was placed in dry dock, being supported on cradles near the ends, so as to produce sagging stresses, and in the middle in order to induce hogging. The experiments were part of the investigation of the Admiralty Destroyer Committee. The results were set forth at considerable length in the paper and in the large number of diagrams which accompanied it. It will be sufficient to say here that the actual results observed on these practical trials established the usual methods of calculation as affording a good margin of safety, the stresses in the observed results being consistently below those calculated by the formulæ commonly used by naval architects.

A paper on a similar subject was read by Mr. F. H. Alexander.

A long and elaborate paper, illustrated by numerous diagrams, was next taken. The subject was the structural arrangements of ships, the author being Mr. J. Bruhn. Details of tests of frame girders, on the strength of flanged plates, on intercostal stringers, on the tripping of frames, and the strength of rivet attachments, were described. The paper was of considerable professional interest, and will form a valuable source of information to naval architects; but without the aid of the numerous illustrations and diagrams it would be impossible to make the descriptions clear.

At the evening meeting of the same day a paper by Mr. R. E. Froude on hollow *versus* straight lines opened the proceedings. The subject has attracted a good deal of interest of late, and has already led to some discussion. A number of naval officers, led by Admiral Fitzgerald, hold that a great mistake is made by building ships for the Royal Navy with hollow lines. Sir William White and the other naval constructors naturally defend their practice, supporting their arguments by the actual results obtained at the Haslar tank. The naval men reply that, even allowing the superiority of hollow lines in the smooth water, at which all tank experiments were made, the hollow lines gave a slower vessel amongst waves, and also a wetter ship. In order to bring the matter to a practical issue, a number of experiments were made by Mr. Froude at the Haslar tank, in which artificial waves were created by a mechanical device. The results were plotted on diagrams attached to the paper, the general conclusion arrived at by Mr. Froude being that though there was a distinct diminution in average effective horse-power due to straight lines, yet this was insufficient to annul the greater efficiency of the hollow lines in smooth water. In the discussion that followed, Admiral Fitzgerald joined issue on this point. He held that quite smooth water was comparatively rarely met with at sea, and he considered it was a question for naval officers, and not for naval architects, to decide under which condition they would prefer the higher efficiency. Moreover, the straight lines gave greater displacement forward without extra cost, and the additional buoyancy could be used for placing heavier guns forward, or in other useful ways. Prof. Biles also joined in the discussion. He gave the results of trials on this subject made at the Dumbarton tank. These results were in contradiction to those given in Mr. Froude's paper, and until this discrepancy is explained the subject must remain unsettled. The need for an independent tank devoted to experimental investigation is apparent. Mr. Froude's experiments are extremely interesting, as being the first tank trials made in other than smooth water. When it is remembered how little smooth water there is at sea, and how widely the conditions of resistance and other qualities are altered by waves, the advantage of the new departure will be apparent.

An interesting paper by Mr. A. W. Johns, of the Royal Corps of Naval Constructors, was also read at this sitting, the subject being the effect of motion ahead on the rolling of ships. The subject is one both of interest and importance, and was worked out by the author with considerable ingenuity, theoretical results being compared with those obtained by experiment. It would appear that the effect of speed is to reduce rolling, but no doubt further tests will be made, the actual experimental data up to now being somewhat meagre.

Mr. Stromeyer also read a paper on the effect of acceleration on ship resistance.

Another paper was down for reading at this sitting, but unfortunately time did not permit of it being read. It was by Mr. S. Popper, of Pola, the subject being the results of model experiments in deep and in shallow water. The subject is one of considerable practical importance at the present time, when builders of destroyers in the south find it pays them to send their vessels to the measured mile on the Clyde, where there is deep water. They find the Clyde mile permits of a knot more being made than can be obtained on any of the comparatively shallow miles of the south.

On Friday, April 14, five papers were taken. Mr. A. E. Seaton contributed the first, the subject being margins and factors of safety and their influence on marine designs. Mr. J. H. Heck followed with some notes on the variation of angular velocity in the shafting of marine engines; and Mr. Mallock read a brief paper in which he described an ingenious device for keeping the two sets of engines of a twin screw vessel out of step, so as to prevent vibration. Mr. Attwood also read a paper on the Admiralty course of study for the training of naval architects.

Perhaps the most interesting paper of the meeting was that which came last. It was by Mr. J. B. Millet, of Boston, Massachusetts, and described a means of submarine signalling by sound, of which more will probably be heard in the future. Briefly it may be said that the sides of the ship itself are used as receivers. A tank filled with a dense liquid is attached to each side of the ship. In this a transmitter is placed, and the sound collected is taken by wires to an observer, who may be in any part of the vessel. If the source of sound is on the port side the sound will be apparent from the port transmitter; if on the starboard side the starboard transmitter will be affected; if it is directly ahead it will be heard equally through both transmitters. When the sound is astern a different effect is produced. As the result of practical trials, the positions of passing ships and of submarine bells were accurately defined. When it is remembered how untrustworthy sound signals are when passed through air, and how unchanging is the density of water, it will be seen that the new system promises to reduce the chief dangers of modern navigation, collisions, or strandings through fog. The idea of submarine sound signals, of course, is not new, but the hitherto insuperable difficulty in the way has been the confusion of sound through the overwhelming nature of the noises in the ship itself. Mr. Millet, however, appears to have overcome this difficulty, and the testimony as to the value of his invention is very strong.

The meeting was brought to a conclusion by the usual votes of thanks.

UNSOLVED PROBLEMS IN ELECTRICAL ENGINEERING.

ON April 10 Colonel R. E. Crompton delivered the annual "James Forrest" lecture of the Institution of Civil Engineers, an abstract of which is given below.

There are two groups of electrical problems, those which concern the scientific investigator and those presenting themselves to engineers. The lecturer dealt with the latter only. The phenomena of lightning discharges, especially where they affect the distribution systems of large electric power plants, require further study. Many failures are due to causes which the lecturer believes to be static discharges due to gigantic condenser effects set up in systems of well insulated overhead and underground conductors, each system acting as a plate of the condenser.

Interesting problems arise out of terrestrial magnetism; the present hypotheses are based on scant knowledge. It is known that the earth's magnetic field is not symmetrical, but the work of observing the variations of the earth's field at public observatories all over the world may eventually enable the earth's field gradually to be plotted out.

Another problem passing into the domain of engineering is the etheric transmission of power. What is now required is a better solution of the problem of producing continuous trains of Hertzian waves either by mechanical means or by electrochemical means.

The lecturer dealt rather fully with what he called the "core and coil" problem of electrical machinery, that is to say, the problems connected with the perfecting of the cores, hitherto of iron, but which in future may be made of some of the alloys invented by Dr. Huesler, which are now under test.

Dealing with the present means of using iron or steel castings of high permeability, the best methods were discussed of freeing them from blow-holes or porosity to ensure that the magnet cores should be of equal density of mass, and therefore of equal magnetic moment. In this connection the lecturer alluded to Prof. Barrett's discovery of

adding silicon, thereby increasing the fluidity and reducing the tendency to form blow-holes; he also gave reasons why increased permeability might be expected from this, as the addition of silicon probably acts by reducing the combined carbon in the iron, leaving the pure iron with a sponge or network structural formation calculated to give great freedom for molecular movement.

On the subject of coil winding, he showed by diagrams that at present the space occupied by insulation may be reduced by winding the copper upon the coils in the form of thin strip on edge, and insulating the portions from one another by a paint or varnish of sufficient dielectric strength, high heat conductivity, and power of retaining its dielectric strength at temperatures of 200° C. The thinness and fragility of the copper strip, however, demand that this should be done by a machine which will roll the copper to the section and curvature just as it is ready to be wound on. The difficulty was alluded to of designing the cores and windings of high-speed turbo-generators, owing to the trouble of resisting mechanical stresses due to centrifugal forces, and at the same time of subdividing them sufficiently to prevent the formation of eddy currents.

It was pointed out that although recently the developments of electrical storage have not been much discussed, it would be better to go on improving the lead couple accumulator we now have instead of waiting for the invention of some new storage couple which we may never obtain. The combination of the internal combustion engine driving a generator and worked by suction gas plant for long hours, thereby charging a battery of accumulators, is, if combined with a small steam plant capable of taking the peak load, probably the most economical method of producing energy for the short hours of lighting. Portable storage is much required for the modern automobile, and some progress has been made, but much still remains to be done. The lecturer did not believe that much could be gained from Edison's newly invented couple.

The utilisation of single phase alternating currents for railways is already within reach, the choice of systems lying between the Finzi type of series motors and the Winter and Eichsberg compensated repulsion motors. Electric traction can supersede existing steam haulage for passenger work at the present schedule speeds with economy and advantage. It is not quite certain that electric haulage will supersede steam haulage for high-speed passenger work, as, although undoubtedly electric haulage can work trains at 100 miles an hour, the steam locomotive can be improved to work at the same speed with equal safety. Engineers will not attack the long distance haulage of goods for years to come, at least not in our present state of knowledge of the cost of generating electrical energy. The successful development by electrical means of change speed and torque gear is much needed by the mechanical engineer, not only for railway work, but for rolling mills and similar purposes.

The measuring instruments used by electrical engineers have made great strides towards perfection, but there are some problems still unsolved, notably the power measurements of alternating currents.

Although there have been recently many attempts to improve the efficiency of electric lamps, both of the arc and incandescent type, yet much remains to be done. By using a beam of violet-blue light of considerable intensity it is nearly certain that many substances hitherto considered opaque, but which owe their opacity to the diffused refraction of the red and yellow rays, will be rendered transparent.

A problem of great importance will be the discovery of a direct method of producing cold by electric means, as by such methods cold storage will be facilitated in the larders of private houses.

Electric smelting has made great advances, and although it presents many unsolved problems, much may be hoped for in this direction.

The problem which is of the greatest interest to the world in general is the satisfactory development of power schemes by which the population can be sent back to the land. The solution is more difficult in this country, where we have no power supply from natural water power, but progress may nevertheless be expected.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

AT the graduation ceremony of Glasgow University on Tuesday, the degree of Doctor of Laws was conferred upon Prof. A. Crum Brown, F.R.S.

IT is announced by *Science* that gifts of 20,000*l.* to Rochester University for the construction of a scientific building, and of 10,000*l.* to Norwich University, Vermont, half for a library and half for an engineering department, have been announced. A donation of 50,000*l.* has been made to Northwestern University by Mr. Milton H. Wilson, a resident of Evanston, and one of the trustees of the institution.

REPLYING to a discussion on university education in Ireland which was raised on the Civil Service Estimates in the House of Commons on April 13, Mr. Balfour gave it as his opinion that Ireland is not provided for adequately in respect of university education. The decline in the number of students in Trinity College he ascribes to the great revolutions in the system of land tenure, which have diminished substantially the resources and the numbers of the class that send students to that institution. There is also a diminution of attendance at the Queen's College, Belfast, which is largely due to the influence which the Royal University is exercising on education in its higher forms by substituting a mere system of examination for a university training. Another reason for the falling off at the Queen's College is that the institution is without the funds necessary for complete equipment.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—"On the Absence or Marked Diminution of Free Hydrochloric Acid in the Gastric Contents in Malignant Disease of Organs other than the Stomach." By Prof. Benjamin **Moore**, in collaboration with Dr. W. **Alexander**, Mr. R. E. **Kelly**, and Mr. H. E. **Roaf**.

It has long been known that free hydrochloric acid is absent or reduced in amount in the great majority of cases of cancer of the stomach.

The absence of the acid in such cases has been attributed to local action, to continued irritation of the mucous membrane of the stomach by the presence of the growth, to retention of the food in the stomach acting as an irritant and causing gastritis when the growth has narrowed the pyloric opening, or to alkaline products thrown out at the seat of the growth and neutralising the acid.

The facts that the acid is not nearly so frequently absent in gastritis due to causes other than cancer of the stomach, and that the acid may be absent in cases of cancer and where there is no marked gastritis, and where the growth is confined to a small part of the mucous membrane, the remainder being normal, led to the surmise that the absence of free hydrochloric acid in the gastric secretion might not be due to local conditions in the stomach, but to a general condition of the blood which rendered it difficult or impossible for the oxyntic cells of the cardiac glands to secrete the acid.

To test this view, the amount of free hydrochloric acid in the gastric contents was determined in *seventeen* cases of malignant disease in which the growths were situated in regions remote from the stomach, such as tongue, cheek, floor of mouth, rectum, prostate, breast, and uterus.

As a result of the determinations it was found that free hydrochloric acid was either entirely absent (two-thirds of the cases) or greatly reduced in quantity. This shows that the absence of free hydrochloric acid in cancer of the stomach is not due to local action in that organ, but, on the other hand, that cancer, *wherever occurring*, is associated with diminution or absence of the acid from the gastric secretion.

Such a result can only arise by an alteration in the blood, which increases the difficulty of separating free hydrochloric acid by the secreting cells.

It is pointed out in the paper that the most probable alteration in the blood plasma increasing the difficulty of

secretion of hydrochloric acid by the gastric glands is a decrease in the concentration of the hydrogen ions.

Blood plasma is alkaline to some indicators and acid to others, indicating the presence of both hydroxyl ions, upon which its alkalinity depends, and hydrogen ions, giving an acid reaction. Any agency which increases the effective alkalinity of the blood, that is to say, which increases the hydroxyl ions and diminishes the hydrogen ions, will increase the difficulty of separating a secretion containing free hydrochloric acid.

In cases where the gastric secretion has its acidity diminished or reduced to zero, as is found to be the case in carcinoma, it is hence highly probable that the concentration of the hydrogen ions in blood plasma is reduced. The action of the kidney cells in maintaining a definite degree of alkalinity of the plasma is hence altered, so that a greater degree of alkalinity is maintained than in the normal individual.

It has been shown by Loeb that slight increase in alkalinity of the medium leads in certain instances to a more rapid cell division and growth, and if this holds good generally, it is possible that increased alkalinity of the blood plasma may lead to increased activity in cell division, and hence be a stimulating cause leading to formation of new growths.

The acidity was determined by the following methods:—

(*a*) *Total acidity* by titration with phenolphthalein as indicator. This lay very low in the seventeen cancer cases, being normal in one case only, above 0·1 per cent. in four cases, and in the majority one or two drops of decinormal alkali sufficed to render neutral.

(*b*) *Günzberg's reagent for free hydrochloric acid* gave entire absence in eleven out of seventeen cases, a minute trace in five cases (0·0036 per cent. to 0·0109 per cent.), and 0·0365 per cent. was the highest value attained in a single case only.

(*c*) *Hydrolysis of methyl acetate by the filtered gastric contents* for the determination of the concentration of free hydrogen ions was carried out in ten cases, and it was found that the concentration in all these never exceeded one-fifteenth of the average concentration in three normal cases tested by the same method.

March 30.—"Note on Fluorescence and Absorption." By J. B. **Burke.** Communicated by Prof. Larmor, Sec.R.S.

In a paper "On the Change of Absorption produced by Fluorescence"[1] the author gave an account of the experiments by which he found the existence of a very remarkable difference in the absorption of the fluorescent light of uranium glass when in the luminous and non-luminous states. This difference he has attributed[2] to a temporary change in structure or chemical composition of the body when exposed to the influence of the exciting light, and he has been led to regard this as due to new atomic connections giving rise to new frequencies during the period of luminosity, by the formation of unstable aggregates, which radiate intensely, as they disintegrate, the energy which was stored up in their formation; the luminosity being thus the visible manifestation of a process of building up and breaking down of molecules.

Messrs. Nichols and Merritt have found recently[3] that the change of absorption depends upon the intensity of the fluorescence, and that a saturation effect takes place in the absorption as the intensity of the luminosity increases, attaining a maximum with a certain intensity of the fluorescent light. They used, not the fluorescent light from another similarly excited body, but an acetylene flame as the source of the transmitted rays.

M. Camichel has encountered some difficulty in detecting the change with the light from a flame, and this appears to have been due to the use of a screen of uranium glass, 7 cm. in thickness, to cut off the more refrangible rays from the flame, a precaution which is by no means necessary, since the effect has been observed without it. The fluorescence caused by the flame merely diminishes the apparent absorption. The screen, on the other hand, must itself fluoresce, and in so doing—if the effect sought for occurs—absorb to a considerable extent the rays the absorption of which it is proposed to measure on the assumption that they are transmitted by the screen.

For fluorescence of very feeble intensity the effect may not in any circumstances be perceptible.

Furthermore, the fluorescent spectrum of uranium glass is composed of several bands, and these in turn the author regards as discontinuous, and made up of more finely divided bands or lines.

Thus the use of the screen filters the rays, and only those which are not absorbed by uranium glass are transmitted. These would not undergo any change of absorption.

The change of absorption cannot be due to the increased amplitude if the vibrations are linear, but where new free periods are produced by the exciting rays, the intensity and the absorption of the fluorescent light would both depend upon the number and duration of the periods thus produced, and it is this which the change of absorption in fluorescence most distinctly proves.

"The Direct Synthesis of Ammonia." By Dr. E. P. **Perman.** Communicated by Principal E. H. Griffiths, F.R.S.

(1) So far as can be shown by one of the most delicate tests known to chemists, ammonia cannot be synthesised by heat (except under special conditions specified below). The decomposition of ammonia by heat may, therefore, be regarded as an irreversible reaction. (2) Ammonia may be synthesised in small quantities from its constituent elements (*a*) by heating with many of the metals; (*b*) by exploding with oxygen; (*c*) by sparking. These are reversible reactions. (3) It would appear that the synthesis of ammonia is effected only when the gases are ionised; the ionisation would be brought about by sparking, or by the high temperature of an explosion of hydrogen and oxygen. The immediate decomposition of the ammonia formed would be prevented by its sudden cooling. The metals in the presence of moisture also produce "nascent" or ionised hydrogen. (4) It does not appear that nitrides of the metals form an intermediate stage in the formation of ammonia, for it was found that metals readily forming nitrides, *e.g.* magnesium, did not produce more ammonia than the others. (5) There is a close analogy between ozone and ammonia with regard to their synthesis and decomposition; both are formed by sparking, and both are completely decomposed by heat.

"Determination of Vapour-pressure by Air-bubbling." By Dr. E. P. **Perman** and J. H. **Davies.** Communicated by Principal E. H. Griffiths, F.R.S.

It was shown recently by one of the authors that the vapour-pressure of water can be determined with a considerable degree of accuracy by bubbling a current of air through water in a thermostat, and estimating the amount of water evaporated by absorbing it in strong sulphuric acid.

The accuracy of the method has since been questioned, supersaturation being specially suggested as likely to cause error. Experiments have therefore been made in order to discover what error (if any) is introduced by supersaturating the air with moisture before it enters the water in the thermostat. The effect of dust in the air and of electrification have also been investigated. In each case the arrangement of the apparatus was as described in the previous paper.

Supersaturation.—Before passing into the flasks in the thermostat, which was maintained at 70°, the air was bubbled through a large wash-bottle containing water at about 85°.

Dust in the Air.—A thick smoke was made by burning pieces of phosphorus near the inlet tube of the apparatus described in the former paper.

Electrification of the Air.—(1) The air was made to pass through a large flask in which hydrogen was being rapidly evolved from zinc and dilute sulphuric acid.

(2) One terminal of an induction-coil, capable of giving (with the battery power used) a 6-inch spark, was connected with a wire passing into the first (nearest the inlet) flask in the thermostat; the other terminal was connected with the bath, so that the silent discharge passed through the flasks and the air inside.

[1] *Philosophical Transactions*, (A) 1898; NATURE, July 15, 1897.
[2] British Assoc. Report, Belfast, 1902, and *Phil. Mag.*, 1901.
[3] *Physical Review*, December, 1904.

(3) The X-rays from an ordinary focus-tube were allowed to fall on the flasks in the thermostat, and were specially directed on to the last (nearest outlet). A wire from one of the terminals of a Wimshurst machine was passed down the gauge-tube into the last flask, the other terminal being connected with the bath.

The last mentioned experiments gave vapour-pressures 237·5 and 238·0, instead of the normal value 234·0.

The greatest deviation from the normal value obtained in the other experiments was slightly more than 0·5 per cent., which is almost exactly the same as that obtained in the original investigation.

It may safely be concluded, therefore, that no naturally occurring supersaturation, or dust, or electrification of the air would have any appreciable effect on the result.

April 6.—"On Endophytic Adaptation shown by *Erysiphe Graminis* DC. under Cultural Conditions." By E. S. **Salmon.** Communicated by Prof. H. Marshall Ward, F.R.S.

In recent papers by the author the fact has been pointed out that certain species of the Erysiphaceæ are able, under cultural conditions, to infect their host-plants vigorously when their conidia or ascospores are sown on the cells of the internal tissues exposed by means of a wound, although the fungi in question are confined normally to the external surface of the epidermal cells.

The author, reviewing the results of the present investigations, points out that they afford proof that *E. graminis* is not, as perhaps might have been expected, so highly specialised as an ectoparasite as to be necessarily restricted for its food-supply to cells of the epidermis, but shows itself capable of immediate adaptation to conditions closely resembling those obtaining in endophytism.

This fact suggests the possibility that in some circumstances the mycelial hyphæ of species of the Erysiphaceæ which are normally ectoparasites may penetrate into the internal tissues of their host-plants exposed through wounds caused in nature by the attacks of animals or by physical agency. It is pointed out, however, that the successful entry of the hyphæ might be prevented, either by the drying up of the superficial layers of cells, or by the healing processes shown by many actively growing leaves.

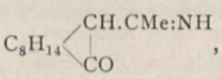
"On the Physical Chemistry of the Toxin-Antitoxin Reaction: with Special Reference to the Neutralisation of Lysin by Antilysin." By J. A. **Craw.** Communicated by Dr. C. J. Martin, F.R.S.

Summary of Conclusions.—(1) Megatherium lysin passed through a gelatin filter, and is diffusible through gelatin. (2) Megatherium antilysin does not pass through a gelatin filter, and is not appreciably diffusible through gelatin. (3) The filtration and diffusion of mixtures show that free lysin is present in neutral mixtures and in mixtures containing excess of antilysin. (4) Free antilysin exists in neutral mixtures, and in mixtures containing excess of lysin. (5) The reaction is at least partially reversible when excess of antilysin is present. (6) False equilibria are produced with greater facility when the lysin is in excess. (7) The neutralisation equation of Arrhenius and Madsen does not hold for multiple mixtures. (8) The removal of lysin from a solution by antilysin is not capable of interpretation as a purely chemical change, but is more analogous to certain adsorption phenomena.

Faraday Society, April 4.—Prof. A. K. Huntington in the chair.—Alloys of copper and bismuth: A. H. **Hiorns.** Results of a further research on copper alloys carried out in a similar manner to that on the copper-arsenic series published in the *Transactions* of the society, April, 1904. Prof. Arnold has investigated the effect of bismuth, from 0·1 per cent. to 0·5 per cent., on copper, and found that the investing membranes surrounding the grains of copper appeared to be split down the centre, presenting a definite plane of cleavage. Dr. Gautier obtained a freezing-point curve similar to the author's, but his temperatures are generally higher. The microscopic evidence mainly confirms the records of the freezing-point curves, of which there are four branches.—Refractory materials for furnace linings: E. Kilburn **Scott.** (Discussion.)—Electrically heated carbon tube furnaces, part i.: R. S. **Hutton** and W. H. **Patterson.** This type of furnace seems to be the most readily available for the very highest temperatures, and the authors have been able to get satisfactory results with a very simple type of construction. The important points to bear in mind are the end connections (which must be kept cool), protection of the tube from contact with air, and heat insulation. Two types of furnace are described:—(1) graphite tube furnace; (2) agglomerated carbon tube furnaces.

Anthropological Institute, April 4.—Prof. W. Gowland, president, in the chair.—The fort and stone-lined pits at Inyanga contrasted with the Great Zimbabwe: R. N. **Hall.** The walls of the fort are built upon a curved plan, and the fort itself is divided into enclosures for purposes of defence. The fort has twenty-five entrances pierced through the walls which are themselves pierced with a great number of loopholes. The fort is also peculiar for the employment of banquette walls, which are not met with except in a few ruins in southern Rhodesia. Another peculiarity of the building is the absence of buttresses. The stone-lined pits are very numerous throughout Inyanga, and are usually found in clusters of twos and threes. Mr. Hall was of opinion that they were not used as slave-pits, as had been supposed, but as shelters from the variable temperature. The pits consist of a hole lined with masonry, and a curved, paved passage used as an entrance. In almost every case the pits have a drain running through the rampart, and another peculiarity is the erection near them of a stone monolith. Mr. Hall also referred to the hill terraces found in the neighbourhood, and in conclusion contrasted the architecture of the fort and pits with the temple and acropolis at Zimbabwe.

Chemical Society, April 6.—Prof. R. Meldola, F.R.S., president, in the chair.—The kinetics of chemical changes which are reversible. The decomposition of *as*-dimethylcarbamide: C. E. **Fawsitt.** This investigation is a continuation of those already published on carbamide and methylcarbamide, and the same explanation of the decomposition holds good.—A new formation of acetylcamphor: M. O. **Forster** and Miss H. M. **Judd.** The imine



obtained by the action of magnesium methyl iodide on α-cyanocamphor, is resolved quantitatively by acids into acetylcamphor and ammonia.—Preparation and properties of 1 : 4 : 5-trimethylglyoxaline: H. A. D. **Jowett.** This base was prepared in the course of an attempt to obtain substances having a constitution analogous to that of pilocarpine. The base and a number of its salts are described.—Bromomethyl heptyl ketone: H. A. D. **Jowett.** This bromoketone is obtained by the action of bromine in chloroform solution on methyl heptyl ketone obtained from oil of rue.—Limonene nitrosocyanides and their derivatives: F. P. **Leach.** The α-nitrosocyanide crystallises in prisms whilst the β-compound forms fine woolly needles. These isomerides are regarded as having the *cis* and *trans* configurations, since on hydrolysis both give rise to the normal oxime of dihydrocarvone.—The action of carbon monoxide on ammonia: H. **Jackson** and D. **Northall-Laurie.** The authors find that the main reaction is the formation of ammonium cyanate, which rapidly changes to carbamide.—The action of acetylene on aqueous and hydrochloric acid solutions of mercuric chloride: J. S. S. **Brame.** The first action of acetylene on mercuric chloride is shown to be one of simple combination, the product being then decomposed by water forming aldehyde and the substance $C(HgCl)_3.CHO$.—The basic properties of oxygen at low temperatures. Additive compounds of the halogens with organic substances containing oxygen: D. **McIntosh.** Crystalline compounds of chlorine and bromine with methyl and ethyl alcohols, methyl ether, acetone, ethyl acetate, acetaldehyde, and acetic acid have been obtained.—Note on the interaction of metallic cyanides and organic halides: N. V. **Sidgwick.** A possible explanation of the formation of both nitriles and *iso*cyanides in this reaction from the same initial additive compound is given.—The chemical dynamics of the reactions between sodium thiosulphate and organic halogen compounds, part ii., halogen substituted acetates: A. **Slator.** The reactions of the

thiosulphate with ethyl iodoacetate and methyl, ethyl and sodium bromo- and chloro-acetates have been investigated, and shown in all cases to be bimolecular reactions.—The tautomerism of acetyl thiocyanate: A. E. **Dixon** and J. **Hawthorne.**—A method of determining the specific gravity of soluble salts by displacement in their own mother liquor, and its application in the case of the alkali halides: J. Y. **Buchanan.**—The combination of mercaptans with unsaturated ketonic compounds: S. **Ruhemann.**—The existence of a carbide of magnesium: J. T. **Nance.** The yellow residue formed when magnesium is heated with carbon evolves hydrogen and acetylene when dissolved in acids, and may contain a carbide.—Isomeric salts of the type $NR_1R_2H_3$. A correction. Isomeric forms of *d*-bromo- and *d*-chloro-camphorsulphonic acids: F. S. **Kipping.** The further study of the isomeric α and β salts has shown that the isomerism of these compounds is not due to difference in the spatial arrangement of the groups attached to the quinquevalent nitrogen atom, but to the existence of *cis* and *trans* forms of *d*-bromo- and *d*-chloro-camphorsulphonic acids.—Isomerism of α-bromo- and α-chlorocamphor: F. S. **Kipping.**—*l*-Phenylethylamine: F. S. **Kipping** and A. E. **Hunter.**—The influence of the hydroxyl and alkoxyl groups on the velocity of saponification, part i.: A. **Findlay** and W. E. S. **Turner.** The numbers obtained show that the hydroxyl group exercises an accelerating influence on the velocity of saponification, but that on replacing the hydrogen of the hydroxyl by an alkyl group the rate diminishes, and the effect increases regularly with the mass of the alkyl group.

Linnean Society, April 6.—Mr. A. C. Seward, F.R.S., vice-president, in the chair.—Specimens and drawings of pitchers of Nepenthes, supplemented by slides, prepared by Mr. L. Farmar, to illustrate the various types of pitchers and their marvellous glandular systems: W. Botting **Hemsley,** F.R.S. Mr. Hemsley first exhibited a new species, *Nepenthes Macfarlanei,* which differs from all other known species, except *N. Lowii,* in the underside of the lip being thickly beset with stiff bristles, interspersed with honey-glands. Other species were compared with *N. Macfarlanei.* Briefly, all the complex arrangements of these plants favour the descent of insects and other creatures into the pitchers, and hinder almost all visitors from getting out again; once in, there is little hope of escape. A few hybrids were also shown, notably one named "Sir William Thiselton-Dyer," which has produced the largest pitcher known in cultivation, being a pint and three-quarters in capacity.—The axillary scales of aquatic Monocotyledons: Prof. R. J. Harvey **Gibson.** The author compared the ligule of Selaginella with the scales in question, and suggested that the latter may be looked upon as evidence that the Monocotyledons may be regarded as modern representatives of primitive Angiosperms, and in turn may have been genetically related to some ancestral form allied to Isoetes.—A further contribution to the study of *Pelomyxa palustris* (Greeff): Mrs. L. J. **Veley.** After alluding to her previous memoir in the *Quarterly Journal of Microscopical Science,* n. ser. xxxvi. (1894), pp. 295–306, the author explained that the "rods" present in *Pelomyxa palustris* (Greeff) are symbiotic bacteria (*Cladothrix pelomyxae,* Veley); they complete their development within the animal and are then ejected, breaking down into free "swarmers," which are ingested by other Pelomyxæ, and immediately re-commence the cycle. The "refringent bodies" are proteid in nature, viz. some form of albumin which is a waste product of the metabolism of Pelomyxa. They supply the bacteria with a point of attachment necessary for development, and (probably) also with nourishment.—Mansonieæ, a new tribe of the natural order Sterculiaceæ: Dr. D. **Prain.**

PARIS.

Academy of Sciences, April 10.—M. Troost in the chair.—Remarks on the recognition of the solar corona at times other than during total eclipses: H. **Deslandres.** A criticism of the results recently obtained by Hansky, in which the difficulties introduced by diffused light in the apparatus do not appear to have been sufficiently taken into account. The use of a simple concave mirror, as employed by Huggins in 1883, is decidedly preferable to the system of two lenses and a mirror used by Hansky. Details are given of the method suggested by the author.—The conclusions to be drawn from the study of homogeneous enclosures in petrography: A. **Lacroix.**—The plants of the plateau of the Nilghirris: Gaston **Bonnier.** The mean temperature of Ootacamund is practically the same as that of Paris, and a detailed comparison of the flora of the two places is given. The altitude of the Nilghirris is not sufficient for the plants to acquire all the characteristics of alpine plants, but they acquire certain alpine characters. There are also special modifications induced by the large difference between the day and night temperature.—On the Peneideæ and Stenopideæ collected by the French and Monaco expeditions in the eastern Atlantic: E. L. **Bouvier.**—The conflict between the primary and accidental images, applied to the theory of inevitable variability of retinal impressions excited by objects illuminated by sources of light of constant value: A. **Chauveau.** The impression produced on the retina by a geometrical figure is complex, and is a resultant formed by the superposition of two images, the one objective, the other subjective, and an experiment is described showing how these may be separated. The effects of colour, intensity of illumination, motion of the retina, displacement of the eye or the object, and accommodation are considered systematically. The case of the *n*-rays is not actually taken by the author, but the considerations here put forward clearly suffice to explain many of the phenomena ascribed to the action of these rays.—The heat of formation of sodium hydride. The acidity of the molecule of hydrogen: M. **de Forcrand.**—On the reduction of oxyhæmoglobin: R. **Lepine** and M. **Boulud.** The oxyhæmoglobin is reduced with a titrated solution of ferrous sulphate, and the time of reduction noted, the colouring matter being considered as reduced when the two absorption bands fuse together. In normal blood from the dog the time of reduction is fixed, and is between eighteen and twenty minutes, and this time is independent of the dilution. In anæmia, with a quantity of the reducing agent proportional to the amount of hæmoglobin, the time of reduction is much increased. Prolonged inhalation of ether or chloroform also increases the time of reduction. Human blood from anæmic patients shows the same characteristics.—On Rhabdocarpus, the seeds and the evolution of the Cordaiteæ: M. **Grand'Eury.**—Report presented in the name of the committee charged with the scientific control of the geodesic operations at the equator. The operations have been much delayed by the unfavourable meteorological conditions and by the illness of several members of the expedition. A short account is given of the progress made in triangulation, levelling, and pendulum observations. An astronomical station has been installed at Cuenca, and another will be set up near the fourth parallel. On account of the limited financial resources of the expedition, it is proposed that a portion of the original scheme be dropped.—Observations of the Giacobini comet (1905 *a*) made at the Observatory of Algiers with the 31·8 cm. bent equatorial: MM. **Rambaud** and **Sy.** The observations were made on March 28, 29, and 30, and give the apparent positions of the comet with the positions of comparison stars. On March 28, when the atmospheric conditions were exceptionally favourable, a nucleus could be clearly made out of about the thirteenth magnitude.—Actinometric observations at the summit of Mont Blanc in 1904: A. **Hansky.** The weather conditions were not favourable. The most probable value of the solar constant from the 1904 observations is 3·28 calories.—On integral functions: Eugène **Fabry.**—On Monge's problem: P. **Zervos.**—On the equilibrium of arches in circular arcs: M. **Belzecki.**—On the longitudinal stability of aërostats: L. **Torres.** A discussion of a paper on the same subject by M. Renard, in which, as the result of a theoretical investigation, certain modifications of the stern are suggested. In the present paper it is shown that this investigation is not strictly correct, and that the modifications suggested will not have the desired effect.—On the diamagnetism of bismuth: A. **Leduc.** Bismuth was fused in small spherical flasks and allowed to solidify in a strong magnetic field (4000 to 5000 C.G.S. units). The sphere of solid bismuth, suspended in the same field, took up the same position as it

had at the moment of solidification.—Contribution to the study of ionisation in flames: Pierre **Massoulier.** The conductivity of an ether flame is considerable. By introducing increasing proportions of carbon dioxide into this flame, although the temperature is lowered, the ionisation, as measured by the current between two electrodes in the flame, is increased. The results are interpreted by the author as being due to the dissociation of the carbon dioxide in the flame.—On the variation of the difference of contact potential for miscible solutions of electrolytes: M. **Chanoz.**—On the dichroism produced by radium in colourless quartz and on a thermoelectric phenomenon observed in striated smoky quartz: N. **Egoroff.** Colourless quartz, exposed to the action of radium for a week, exhibited dichroism identical with that ordinarily observed with smoky quartz. A plate of smoky quartz, heated to 100° C. and treated with a mixture of sulphur and red lead, gave a figure reproducing the striations.—An automatic damping arrangement applicable to pendular and oscillatory movements: V. **Crémieu.**—On a photograph of a lightning flash showing the air in incandescence: Em. **Touchet.** The persistent glow which is visible in some cases after a lightning flash is due to the incandescence of the air. This effect is not physiological, as it is clearly shown in some photographs taken by the author and by other experimenters.—The etherification of glycerin: Marcel P. S. **Guédras.**—The liquefaction of allene and allylene: MM. **Lespieau** and **Chavanne.** The two gases were prepared with great care in a pure state and solidified in liquid air. Allene melts at −146° C., boiling at −32° C., its critical point being about 121° C. Allylene melts at −110° C., boils at −23°·5 C., and has a critical point of 129°·5 C., the temperatures being all measured by an iron-constantan thermo-couple. The purity of the gases was determined by a combustion analysis.—On the hydrogenation of benzonitrile and paratoluonitrile: A. **Frébault.** Sabatier and Senderens, who have already applied their reaction to this case, found that nickel carried the reduction too far, toluene and ammonia being the only products, and were obliged to replace the nickel by copper to obtain benzylamines. Working under somewhat different conditions, the author has obtained results with nickel.—Secondary diazoamines: Léo **Vignon** and A. **Simonet.**—On the hydrates of acetol: André **Kling.**—On the use of the metal ammoniums in chemistry: the preparation of paraffins: Paul **Lebeau** (see p. 592).—On isodimorphism: Fred. **Wallerant.**—On a new indiarubber Euphorbia: Henri **Jumelle.** This tree grows in the north-west of Madagascar, and its indiarubber-producing properties were discovered accidentally by the natives. It appears to be a new species, and is named *Euphorbia elastica*.—The action of ether and chloroform on dried seeds: Paul **Becquerel.** The result is due to action of these substances on the fatty material of the cell, but the effect of the chloroform is much more energetic.—On the formation and function of fatty materials in fungi: A. **Perrier.** It is shown that the fat acts as a reserve food material for the plant.—On some points of anatomy of the male organs of the Edentata, and on their means of fixation: Rémy **Perrier.** It is shown that this is not a case of retrogression, but that the condition of the male organs corresponds to a primitive form. This view confirms the palæontological results as to the age of the Edentata.—The weight of the brain as a function of the body weight in birds: L. **Lapicque** and P. **Girard.** The exponential formula given by Dubois for expressing the weight of the brain as a function of the body weight holds for the case of birds, the index having the same numerical value as in mammals (0·56).—On the alternation of eclipses and the lustre of feebly lighted objects: Th. **Lullin.**—The spectroscopy of the blood and of oxyhæmoglobin: M. **Piettre** and A. **Vila.** The reaction of sodium fluoride upon the absorption spectrum of blood is a very delicate one, and can be used to detect traces of fluorides down to 5 parts in a million. A diagram is given of the relation between the intensity of the absorption bands of oxyhæmoglobin and the dilution.—On the normal presence of alcohol and acetone in the liquids and tissues of the organism: F. **Maignon.**—Researches on hæmatogen: MM. **Hugounenq** and **Morel.**—The influence of the state of liquefaction of starch on its transformation by diastases: A. **Fernbach** and J. **Wolff.**—Experimental acid dyscrasia: M. **Charrin.**—On the age of the granite of the western Alps and the origin of the crystalline exotic blocks of Klippes: C. G. S. **Sandberg.**—On the Lahore earthquake and the variations of the magnetic needle at Paris: Th. **Moureaux.** Disturbances of the magnetic records at Paris were observed on the day of the Lahore earthquake.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* (physico-mathematical section), part vi. for 1904, contains the following memoirs communicated to the society:—

October 29.—W. **Voigt**: Remarks on tensor-analysis. A. **Schœnflies**: On the geometrical invariants of the analysis of position. Eduard **Riecke**: Researches on the phenomena of discharge in Geissler tubes. F. **Bernstein**: On the theory of aggregates.

December 17.—G. **Herglotz**: On the calculation of retarded potentials.

DIARY OF SOCIETIES.

THURSDAY, APRIL 27.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—*Discussion*: Mr. B. J. Arnold's Address to the Joint Meeting at St. Louis on the Problem of the Alternate Current Motor applied to Traction.—*Paper*: The Alternate Current Series Motor: F. Creedy.

FRIDAY, APRIL 28.

EPIDEMIOLOGICAL SOCIETY, at 8.30.

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