Nature. Vol. XII, No. 297 July 8, 1875

London: Macmillan Journals, July 8, 1875

THURSDAY, JULY 8, 1875

HOLLAND'S "FRAGMENTARY PAPERS"

Fragmentary Papers on Science and other Subjects. By the late Sir Henry Holland, Bart. Edited by his Son, Rev. Francis J. Holland. (London : Longmans, 1875.)

IT is impossible not to be struck with the width of knowledge, the balance of intellect, and the true wisdom shown in the posthumous writings of the late Sir Henry Holland. This distinguished physician was born as long ago as 1788, when many of the most extensive and important sciences—Chemistry, Electricity, Heat, Geology, and others—could hardly be said to exist. Yet we find in these papers that he was fully alive to discoveries which were quite recently made. Not only does he appear to have accepted the Evolution Philosophy in a thorough-going manner, and to have acquired a perfect comprehension of its bearings and results, but the latest discoveries in each branch of physical science were familiar to him, and duly considered in retouching his papers for the last time. Writing in 1873 at the age of eighty-five, he naïvely remarks that it would be impossible at his age to re-write the whole of his essays so as to bring them up completely to the present day. He therefore proposed to select what was most suitable for publication, making such additions as were suggested by the recent progress of research.

The essays, as now published, range over most of the physical and moral sciences, and touch upon theology. The Plurality of Worlds, Creative Power, Matter and Force, Divisibility of Matter, the Nature of Electricity, Animal Instincts, the Perfectibility of Man, Infinity, Eternity, Materialism, Scepticism, Subjective Functions of the Eye, Sleep and Dreams,—such are only a part of the topics upon which he discourses. It is, of course, out of the question that an old man writing between the seventieth and eighty-fifth year of his age could give much that is original and novel upon such a wide range of subjects. Of this he must have been fully conscious, and his object appears rather to have been to sum up the results of the progress of science as he had witnessed that progress, and to point out how far it had really gone in comparison with the possible sphere of discovery. His principal conclusion is, that no efforts of scientific men have yet, or indeed ever can, penetrate the mysteries of existence. His favourite expression is that of Laplace : "Notre ignorance est immense."

He more fully states his convictions in the following words :—

"The horizon of our knowledge continually, though unequally, expands—obscure in its boundary on every side, and ultimately defined by limits impassable to human reason. One man by genius or happy accident may press more closely than another towards this horizon ; but the ultimate limit is the same to all, involving those mysteries of matter, force, and creative or governmental power, to which all other problems are subordinate."

One of the most original and interesting essays is that in which Sir Henry Holland treats of "mental operations in relation to time." The same subject had, indeed, been discussed in two chapters of his "Mental Physiology," and he had shown how many striking illustrations of the relations of states of mind in succession, one to the other, may be discovered. He wished to see carried out an experimental inquiry into the chronometry of mind, by observing the velocity with which trains of ideas can be made to move through the mind in various circumstances. The following is an example of the kind of self-experiment which Sir Henry tried (p. 106) :—

"Within a minute I have been able to *coerce* the mind, so to speak, into more than a dozen acts or states of thought, so incongruous that no natural association could possibly bring them into succession. In illustration I note here certain objects which, with a watch before me, I have just succeeded in compressing, *distinctly and successively*, within thirty seconds of time—the pyramids of Ghizeh, the Ornithorhynchus, Julius Cæsar, the Ottawa Falls, the rings of Saturn, the Apollo Belvedere. This is an experiment I have often made on myself, and with the same general result. It would be hard to name or describe the operation of mind by which these successive objects have been thus suddenly evoked and dismissed. There is the volition to change ; but how must we define that effort by which the mind, without any principle of selection or association, can grasp so rapidly a succession of images thus incongruous, drawn seemingly at random from past thoughts and memories? I call it an *effort*, because it is felt as such, and cannot be long continued without fatigue."

This is a curious subject which easily admits of experiment ; but it will be found that the velocity with which thoughts can be made to succeed each other depends entirely upon the degree of similarity or connection between them. Judging from my own experience and that of three students, well qualified to test the matter, I find that where the objects thought of are as incongruous as possible, the number which the mind can suggest to itself in a minute varies from twelve, the result of Sir Henry Holland, up to about twenty. Anyone who tries the experiment, however, will find that there is an almost insuperable temptation to go off on lines of association. To avoid these and yet to think rapidly, requires a very disagreeable effort, becoming more and more painful by repetition.

When the thoughts are restricted within certain grooves, as it were, the result is more rapid succession. Thus one student was able to think in a minute of thirty different kinds of actions, forty-six animals, fifty places, or fifty persons. I can myself think without much effort of thirty-two animals, or forty persons or places in a minute. Even in these cases, however, it will be found that the rapidity greatly depends upon the degree in which the objects have been associated. When thoughts have been very closely and frequently linked together, the number which may be compressed within a minute is much greater. I find that I can count about ninety-six in half a minute, which, without allowing for the two places of figures, gives 192 thoughts per minute. I can think of every letter in the alphabet in five seconds at most, which is at the rate of more than 300 per minute. Finally, by counting the first ten numbers over and over again, I have compressed nearly 400 changes of idea within the minute. Thus it may be said that the facility of mental action varies something like forty-fold, according to the degree of previous association between the ideas.

Little has hitherto been done to investigate the action of mind systematically, but there is little doubt that by

following up the hints given by Sir Henry Holland, Prof. Wendell Holmes, and some others, useful results might be obtained. It is difficult to help agreeing with Sir Henry when he remarks that the opinions of Comte on this subject are a sheer paradox (p. 97). Comte strangely denied the competence of consciousness as an interpreter of mental functions. It may perhaps be allowed that consciousness has not been happily investigated hitherto, but it would be wholly premature to assert that it is incapable of scientific investigation.

W. STANLEY JEVONS

URE'S "DICTIONARY OF ARTS"

Ure's Dictionary of Arts, Manufactures, and Mines. By Robert Hunt, F.R.S., Keeper of Mining Records, &c., &c., assisted by F W. Rudler, F.G.S., and by numerous contributors eminent in science and familiar with manufactures. Seventh edition, in three volumes. (London: Longmans, 1875.)

THIS well-known work, of which the seventh edition is now before us, first made its appearance in the past generation. During the life-time of its original projector and editor, Dr. Andrew Ure, it undoubtedly contributed largely to advance the education and progress of our manufacturing and industrial classes, and well-thumbed copies of it are to be found on the library shelves of all the "Mechanics' Institutions" which the educational revival of thirty years ago scattered over the land.

We find from the preface that since 1858, when the present editor took charge of the work, three editions, including the present, have appeared, so that its reputation as a standard work of reference appears to be still maintained.

In the volumes now before us, there are, as might be expected, great differences from the edition which preceded them, many new industries having arisen, while others, if they have not altogether disappeared, have at least lost much of their importance. The alterations thus arising have overpassed the space left available by the curtailment and omission of some of the articles which had lost their value, and have increased the size of the work to a total of 3,255 pages for the three volumes. Although a long list of contributors succeeds the preface, we imagine that the burden of the major part of this increase must have fallen on the two editors, and it is therefore with considerable pleasure that we congratulate them on the thorough manner in which the revision has been effected, and the very full and complete information given in nearly all cases. We must not, perhaps, complain if the information given in such articles as "Alizarine" and "Aniline" is not very full, since the complete knowledge of the actual methods of production employed in these and in other cases of chemical manufacture are in the possession of persons whose interest it is not to be very explicit in matters involving manufacturing secrets. While, however, the editors are to be praised for keeping the articles abreast of the time in other respects, we cannot agree with them that it is good policy to retain, as they have done, the old equivalentic formulæ beside the atomic ones which are now, and have been for years past, in such general use as to justify the exclusion of the former altogether, as has been done in every other work on chemical subjects printed within the last five years. The acquisition of the modern views and system of formulæ is really so simple a matter that there is no justification for its not being made by everyone interested in the science, and the retention of both forms tends to confuse young workers while conferring at best a doubtful benefit upon those who, having learnt the older form, are not made to feel the necessity of learning the newer.

As may be supposed from the names of the editors, the parts relating to mining and metallurgy are extremely full of valuable information, and we notice particularly an article on coal-cutting machines, one on safety apparatus for mines, and one on mine-ventilation, as deserving attention. Much information is given on printing, and the mixed chemical and mechanical art of calico printing is most exhaustively treated. In the article on the soda manufacture, a good sketch of Schlœsing and Rolland's process is given. The explanation of the devitrification of glass, given in vol. ii. p. 647, is, however, only probably true in a limited number of cases, in many the change being molecular only, and not involving the formation of definite silicates.

The article on coal-gas is particularly full and well written; but in fact this may be said of so many of the subjects treated that it becomes an invidious task to attempt to point out the shortcomings which are in some cases unavoidable in a work of this magnitude, while it is a pleasant one to congratulate Messrs. Hunt and Rudler on the care and ability bestowed on a task of great difficulty. We have only to add that the type of the work has been entirely reset, and the titles of the articles printed in a bold type which renders reference easy.

R. J. F.

DRUMMOND'S "LARGE GAME OF SOUTH AFRICA"

The Large Game and Natural History of South and South-east Africa. From the Journals of the Hon. W. H. Drummond. (Edinburgh: Edmonston and Douglas, 1875.)

THE countries of Amazulu, Amatonga, and Amaswazi form the tract of land bounded on the south by Natal, and on the west by the Transvaal Republic. These were the scenes of Mr. Drummond's experiences, which, he tells us, extended over a period of some five years, ending in 1872. He candidly admits that his knowledge of Natural History as a science is little or nothing, in consequence of which all reference to questions bearing on the subject are omitted, except those which have come within his personal knowledge. Such being the case, we think that we cannot do better than make an attempt to summarise the direct information which the author places before us on those biological questions which are in any way referred to, leaving the discussion of the many valuable observations on sport in general to contemporaries who are in the habit of keeping those subjects in constant view.

Of the nine chapters which constitute the work, the first six treat of the buffalo, rhinoceros, eland, elephant, lion, and leopard; the remaining three being devoted to anecdotes connected with dogs, antelopes, and game birds.

Respecting the first of these animals, the statement that "only one species of buffalo (*Bubalus caffer*) is found in the southern part of Africa," is confirmatory of the results arrived at by all other investigators. Their abundance and ferocity when charging are much emphasised.

Our knowledge of the African rhinoceroses is much more imperfect than that of their Indian allies, and Mr. Drummond's remarks on these animals must be looked upon as those of a reliable and acute observer. We read: "As far as my experience and inquiries have gone, I believe, in accordance with the recorded opinions of most travellers and sportsmen who have given any attention to the subject, that there are four—two of the so-called 'white,' and two of the 'black.'" The way in which these four species are arrived at, presents one point, at least, of special interest. The first species is the *Rhinoceros bicornis*, "borele" or "upetyane," the smallest and most dangerous of the four, it alone being in the habit of attacking man unprovoked. The second is the *R. keitloa*, the "keitloa" or "umkombe tovote," the next largest, with the hind horn, which is quite small in all the others, very nearly as big as, or even sometimes bigger than, the fore one. In one specimen "the horns, which were unusually good, measured twenty-four inches for the front one, twenty for the back." The third species is the *R. simus*, "umkave," or common white rhinoceros, the largest of all; it is "remarkable for the great length the front horn grows to, as well as for its gentle and inoffensive disposition." With this is united as a variety *R. oswellii*, in which the front horn is particularly long and turns forwards; and we are well disposed to agree with Mr. Drummond in thus laying little or no stress on peculiarities in the horns when they are not associated with other characters. For a knowledge of the last species we have to rely entirely on our author. It has an independent native name, which is in its favour, being known as the "Kulumane." It "differs from the other species (*R. simus*) in three important particulars: firstly, in its horns, which, though following the conformation of *R. simus*, never attain to the same size; secondly, in its measurements, which, while considerably inferior to those of the common white, are greater than those of the other two species, while it is to be noted that it possesses, though in a less marked degree, the long and prehensile upper lip which characterises *R. bicornis* and *R. keitloa*; thirdly, in its food, for though preferring, as was to be expected from the formation of its snout, the young tender shoots and leaves of thorns, it also resembles *R. simus* in consuming large quantities of grass. In its disposition it would seem to combine the characteristics of the other species."

The author was fortunate enough to capture and keep alive for a short time a very young individual of the last-described species, and he tells us that "if a specimen were really wanted for this country [which most certainly is the case], and there is not a single one as yet, I have no doubt that the difficulty of finding a substitute for its mother's milk—a serious one in a land where cattle do not exist on account of the tsetse—might be got over by the sacrifice of the lives of a few cows, for, as the bite of this insect does not cause immediate death they might be brought down to the plains, and would probably live long enough to take the young rhinoceros to the higher districts, where plenty of milk could be procured." It is much to be regretted that Mr. Drummond was not able to employ the method he thus describes so clearly, and so put us in possession of an invaluable zoological treasure.

The light thrown on the question as to whether the striped eland is a species differing from the unstriped animal is but small, the author's experience being in favour of there being but one. Both varieties are met with in Amatonga. As to the elephant, its difference from its Asiatic brother in the conformation of its skull produces an important difference in the hunter's point of view also. In the Indian species "the forehead presents a certain mark, while in Africa it is quite impervious." The following observations will also be read with painful interest. "Slowly, but surely, this most useful animal is being extirpated, merely for the purpose of supplying Europe with ivory ornaments and billiard-balls, and before many years are over the inhabitants of Africa will grieve, when it is too late, at the short-sighted policy which has allowed them, for the purposes of immediate gain, to kill down the only animal capable of becoming a beast of burden through the tsetse-infected districts of that continent." The extreme difficulty of taming the animal, the impossibility of breeding it in captivity, and the rapid advance in steam-locomotive power, must, however, be placed in the balance against the advantages which the creature offers.

The portion of the work devoted to the lion and the leopard abounds in incidents, many of which terminated fatally; so many, indeed, that we can hardly understand how it is that the author places the upetyane (*Rhinoceros bicornis*) before the lion in comparing the different shades of danger encountered from the larger varieties of South African animals.

In conclusion, we strongly recommend this book to all who are fond of sport and who require practical hints on minor details before commencing a similar undertaking. To the student of Natural History it will be equally attractive, because of the clear and pleasing manner in which it depicts the manners and habits of several animals in their native haunts, nothing respecting which can be gained from any amount of study of the dry skins or skeletons. It is by his knowledge of the habits of the creatures which he is accustomed to meet, that the practical naturalist can frequently put the museum-student to shame, and for this reason we think that works like the one before us ought to be studied by zoologists.

Some of the illustrations are good, but many of them are quaint and not always accurate. Why the head of a Zebra introduces the chapter on the Eland, and an Aard Wolf does the same with respect to the Leopard, we are at a loss to understand.

BRUSH'S "DETERMINATIVE MINERALOGY"

Manual of Determinative Mineralogy, with an Introduction on Blowpipe Analysis. By George J. Brush, Professor of Mineralogy in the Sheffield Scientific School. (New York: John Wiley and Son, 1875.)

PROF. BRUSH has endeavoured to make the study of mineralogy lighter than usual, and has in many respects succeeded, but unfortunately for the modern

student he has retained the old chemical formulæ. Surely it would have been better to swim with the times and adopt the new atomic weights, taking care to abolish all doubtful tests, and adding the latest and most accurate methods of analysis. Many of the latest and most delicate methods of mineral analysis are entirely omitted, such as Bunsen's methods for the detection of arsenic, antimony, selenium, molybdanum, uranium, &c. The work in question is divided into two distinct parts; the first containing descriptions of the different apparatus and reagents used, and a "Systematic Course of Blowpipe Analysis;" the second, styled "Determinative Mineralogy," makes use of the knowledge acquired in the first part to determine the mineral species under examination. The "Systematic Course of Blowpipe Analysis" is adapted from the later editions of Plattner's work on Blowpipe Analysis, edited by his successor, Prof. Richter; the "Determinative Mineralogy" is a translation of Von Kobell's "Tafeln zur Bestimmung der Mineralien," tenth edition. Generally speaking, students do not take kindly to "Tables," but Prof. Brush has made them more inviting by arranging the minerals having the same base into groups, and studying them in order. This is an excellent arrangement, and the distinguished author deserves the gratitude of students for thus lightening their labours. Too many mineralogical works of the present day exhibit a harum-scarum kind of classification, which simply bewilders the inquiring student and leaves him in greater confusion than before. The first part of the work opens with descriptions of various kinds of blowpipes, and the manner of using them, also the fuel used to obtain the requisite flame. Here, under the headings "Reducing" and "Oxidising" flames, are described very clearly the characters of the two flames, with very good engravings showing the zones. The methods for preparing the various reagents required are trivial and should have been omitted; for instance, we are told to prepare pure carbonate of soda by taking "four or five ounces of *commercial* bicarbonate of soda *free from mechanical impurities*," &c. We should be glad to know where Prof. Brush obtains his commercial bicarbonate of soda so free from impurity, as the manufacturer deserves encouragement. Chapter II. commences the "Systematic Course of Qualitative Blowpipe Analysis," describing the reactions of the elements and their combinations in the "closed tube and open tube," and on "Charcoal as a support." Under the latter heading a very neat and novel method is given for overcoming the great difficulty experienced sometimes in keeping the assay in its place on the charcoal. Let those who wish to work in comfort for the future buy the book, and find the method therein.

Further on, the colours imparted to a flame by different metallic salts are described, but all of them, with the exception of copper, sodium, potassium, lithium, and calcium, might have been left out with perfect justice, for no one could decide what metal was present from a simple examination of the coloured flame as described; that could only be done by means of the spectroscope. Then follow "The uses of Fluxes and Roasting," and "Fusion with Borax," which are simply adaptations from Plattner, and the tables given in this division are literal translations from the same author, which may also be said of the division "Fusion with Salt of Phosphorus." It is only fair to say that in the preface to his book Prof. Brush states: "The main authorities used in the original preparation and later revision of the chapters on blowpipe analysis were the works of Berzelius and Plattner. The third and fourth editions of Plattner, the latter edited by Prof. Richter, have been chiefly consulted." The whole work seems to confine itself almost entirely to blowpipe analysis by the dry method, ignoring very frequently much easier and quicker methods of detection by the wet method of analysis. A few instances may be given, viz., copper when associated with nickel, cobalt, iron, and arsenic by the dry method, proceed as follows:—"Separate *most* of the cobalt and iron by treating with borax on charcoal, the remaining metallic globule is fused with pure lead, and then boric acid is added; this last dissolves the lead and the rest of the cobalt and iron, while most of the arsenic is volatilised. The cupriferous nickel globule which still may contain a little arsenic is treated with salt of phosphorus in the oxidising flame; the bead obtained will be dark green while hot, and clear green when cold. This last green is caused by a mixture of the yellow of oxide of nickel and the blue of oxide of copper." What a complicated and tedious process! Now let us consider the wet method well known to chemists, but not mentioned amongst the "characteristic reactions" in the first part of this book. Dissolve the mineral in nitric acid or nitro-hydrochloric acid, get rid of the excess of nitric acid, precipitate the copper by means of sulphuretted hydrogen, dissolve this precipitate in nitric acid, and add excess of ammonia, when the liquid at once acquires the splendid well-known blue colour. The arsenic will be present as arseniate of ammonia, and will not interfere with the reaction. Even more easily can traces of copper be detected by Bunsen's neat method, as follows:—Fuse the assay on a charcoal match with carbonate of sodium in the reducing flame, treat the fused mass with distilled water in a porcelain basin, gather together (by means of a small magnet) the metallic particles of cobalt, nickel, and iron, and remove them; dissolve the remaining metallic copper in nitric acid; take up a drop of this solution by means of a glass rod and place it upon a strip of white filter-paper, add a drop of ammonia to the moistened paper, and observe the decided blue colour where the drop of solution was placed. Thus, by the time the student had blundered through the dry method of discovering copper, a skilful chemist would almost have determined the percentage of copper present in the assay by some volumetric process. Singularly enough, the above method is mentioned several times *incidentally* in the second part, entitled "Determinative Mineralogy." Under the heading "Iron," no mention is made of the well-known reaction between ferric salts and ferrocyanide of potassium, but doubtful borax bead reactions are very prominent. The characteristic precipitate obtained by mixing soluble lead salts with bichromate of potassium is omitted also. Chapter IV opens with "Determinative Mineralogy." These tables are the best part of the book. The student must be very dull indeed who fails to determine a mineral by the use of them. The method of studying the different minerals is excellent, as the specimen under examination is soon brought into a group; and by glancing at the characteristics of each mineral in that group, and com-

paring the reactions obtained with the specimen, the name is ascertained without difficulty. An example will suffice to show this:—"The mineral has a metallic lustre. Its degree of fusibility is 2, and a portion of it is readily volatile, evolving the garlic-like smell peculiar to arsenical minerals. On looking at the tables it is found to belong to Division I. Fused with carbonate of sodium on charcoal in the reducing flame, no metallic globule is obtained, but the reaction for sulphur is seen on moistening the fused mass and placing it upon a piece of silver. Does not give the reactions for copper or cobalt. In the closed tube gives metallic arsenic, and after long heating becomes magnetic. It is found that it can only be one of two minerals, viz., Arsenopyrite (mispickel) or Lölingite. The streaks, colour, and hardness are the same; but two reactions observed before prove it to be arsenopyrite, for it fuses at 2, and gives a strong sulphur reaction." As we have pointed out, it might have been expected that so distinguished a mineralogist as Prof. Brush would have given us all the more modern methods, but, nevertheless, his book is certainly a very useful one, and may be recommended to the student. CHARLES A. BURGHARDT

OUR BOOK SHELF

Elementary Chemistry. By F S. Barff, M.A. (London: Edward Stanford, 1875.)

THE question which naturally occurs to one on opening this book is, Why was it written? Of late we have had so many books professing to teach elementary chemistry, and some of these really fulfilling their profession, that it is hard to understand why another should be added to the list. In his preface the author says: "This book, as far as it goes, professes to enable the attentive student to acquire a sound knowledge of the very elementary facts concerning the most important of the 'non-metallic elements,' as they are called." Again, he expresses the belief that by the system he has adopted, "boys will have their reasoning faculties strengthened and their powers of observation rendered accurate and acute."

So far as mere facts are concerned, this book appears to to be very trustworthy; the author is evidently well acquainted with his subject; but there is a want of principles to guide the student. If chemistry is to be taught thoroughly, even in its elements, the method of teaching adopted must from the very beginning be a scientific method; it must seek not only to inculcate accuracy of knowledge in detail, but also to point out the generalised expressions which bind together the facts into a connected system. By studying the book before us a boy may certainly gain a considerable amount of good and useful knowledge, but we are afraid that his ideas of what chemical science is will be at best but vague. The author does not appear to have clearly set before himself the end which he desired to secure by writing a book on elementary chemistry. If that end was merely to supply a collection of useful facts about various chemical substances and processes, he has succeeded; but books already existed which supplied this want. If he wished to supply sound chemical knowledge, *so far as the book goes*, he must be said also to have succeeded, but unfortunately he has stopped too soon; the fault is that it does not go quite far enough: a little more carefulness in planning the book, and the introduction of at least a few generalisations to explain the facts, would have added vastly to the value of the book as an elementary educational work. If we compare this little book with others which might be named which cover much the same ground, the want of general ideas to guide the student becomes very apparent. Another question which occurs in connection with a book on chemistry specially intended for the use of boys at school is, Are schoolboys as a rule really interested in this science? Is it found generally advisable to devote any large portion of a schoolboy's time to the study of chemistry; or is it better, when natural science is introduced into a school curriculum, to choose physics as the principal subject-matter for study?

M. M. P. M.

Travels in Portugal. By John Latouche. With Illustrations by the Right Hon. T. Sotheron-Estcourt. (London: Ward, Lock, and Tyler.)

MR. LATOUCHE'S narrative is full of interest and instruction; but why has he not indicated the year or years during which he travelled in Portugal? There is even no date on the title-page. We hope Mr. Latouche will supply the necessary dates in a second edition. The author refers with justice to the general ignorance of Portugal and of its people; many, no doubt, suppose they are a sort of degraded Spaniards, whereas we think it is pretty clear, from the information contained in the work before us, that the Portuguese are in many respects superior to their neighbours. Mr. Latouche evidently knows Portugal well, and has carefully observed the characteristics of its people. In his narrative he wisely gives very few details about the beaten tracks, but describes principally what he saw in districts which are never visited by the ordinary traveller. His work contains much information concerning the people, their ethnology, language, manners, customs, superstitions, and history; about the country itself, its physical features, its natural history, the state of agriculture, and other points of interest. As to the ethnology of Portugal, Mr. Latouche seems to believe that the people are an agglomeration of a greater variety of elements than that of any other country in Europe, and that these elements still remain to a large extent heterogeneous, different elements preponderating in different districts—Celts, Iberians, Phœnicians, Romans, Visigoths, Saracens, Greeks, French, and Jews all contributing their quota. As an illustration of the extensive infusion of Jewish blood throughout all ranks of the people, Mr. Latouche tells the following anecdote:—"When that foolish bigot, King Joseph, proposed to his minister Pombal that all Jews in his kingdom should be compelled to wear white hats as a distinctive badge, that sagacious minister made no objection, but when next he appeared in Council it was with two white hats—'one for his Majesty and one for himself,' explained Pombal, and the King said no more about his proposal." With regard to the natural history of Portugal, Mr. Latouche thinks there is much still to be learned; that, in fact, it has been less studied than that of any other country in Europe. There is no doubt much truth in this, but we hope it will not be necessary for any foreign "patient naturalist" to learn the language, as Mr. Latouche suggests, in order to investigate the natural history of Portugal. Surely there is a sufficient number of competent men in the country itself to undertake the task, if their attention were directed to the importance of having it accomplished. Indeed, we believe there have not been wanting signs recently of an awakening of intellectual life in Portugal, and we hope that one of its results will be a thorough investigation of the natural history of the country, as well as a vast improvement in the wretched system of education which prevails. The Portuguese, as our readers know, were at one time one of the most enterprising people in Europe, and under proper guidance might still occupy an honourable position among the nations.

To those who wish to obtain some trustworthy information concerning the present condition of Portugal, we commend Mr. Latouche's work, which, we may state, is enlarged from a series of articles which were published in the *New Quarterly Magazine*.

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. No notice is taken of anonymous communications.*]

Temperature of the Body in Mountain Climbing

I HAVE read with great interest the able paper on the Temperature of the Human Body during Mountain Climbing in NATURE, vol. xii. p. 132, and as it is there mentioned that the results obtained by Drs. Marcet and Lortet require confirmation, I am tempted to send some extracts from notes of observations made on myself while on a walking tour last autumn, in the Yorkshire moors. I made in all five ascents, of heights over 2,000 feet, during all of which I took notes of my temperature at intervals. As, however, I had no more than a hearsay acquaintance with Dr. Marcet's results, and was not aware of the important influence of the act of ascending as distinguished from the elevation attained, my earlier results were not sufficiently connected to be worth publishing. Suffice it to say that I always obtained a fall of from one to two degrees. On the fifth day of observation, when I was alive to this and other sources of error, I made the following observations in the course of the ascent of Whernside and Gragreth.

	Time.	Height in feet.	Temperature in mouth.
In bed, Chapel le Dale, feeling warm	7.30	900	97·7
Breakfast	8.30	—	—
Before starting, feeling cold	9.40	—	97·6
Walked one mile nearly level; spent half an hour at Gate Kirk Cave, then a steep ascent; after rising 1,000 feet and while hot, tired, and sweating, and before stopping	11.20	1,900	96·4
Sat down; after ten minutes' rest felt fresh, and neither hot nor cold	11.30	—	98·2
Ascent continues steep till near the top, when it is moderate; reached the top hot, sweating, and out of breath; temp. of air 47°, barometer 27·4 in.	12	2,414	97·6
After sitting still in a cold wind and eating 4 oz. biscuits; toes and fingers cold, and shivering slightly	12.37	—	99·3
Steep descent of 1,000 feet, came down at a run; fingers and toes getting warm; before stopping	1.10	1,400	98·0
Crossed the valley to ascend Gragreth; after climbing 500 feet, sweating and feeling hot, and before stopping	2.17	1,900	96·4
After sitting seven minutes	2.24	—	97·6
Still sitting, feeling cooler	2.29	—	98·6
Still sitting	2.33	—	98·6
Nearly at the top	2 47	2,200	98
On the flat top of Gragreth, going slower, feeling cooler	2.52	2,250	98·2
Sitting, feeling cold, strong wind	3.12	—	98·4
After descending 1,050 feet rapidly	3.55	1,200	98 4
After sitting ten minutes	4.5	—	98
Sitting warm, at "George and Dragon" Inn, Dent	9.50	500	97·9

In comparing the temperatures above it should be borne in mind that I uniformly found my temperature in bed in the morning 97·6 or 97·7, and about the same at 9 or 10 at night; while the day previous, when detained in the house by bad weather, it had been 98·4 and 98·6 in several observations, between 10.30 A.M. and 6 P.M., and this I have found the case on many other occasions, so that the difference between the second and third observations really represents a greater depression than is apparent.

It is worthy of note that the two lowest temperatures, viz., 96·4, both occurred during steep ascents and before stopping, and while I was perspiring freely and feeling hot. In each case I immediately sat down and noted a progressive rise in the temperature, though at the same time I was feeling much cooler. When I began to shiver from sitting above half an hour in a strong wind on the top of Whernside the temperature had actually risen to 99°·3. This reminds one of the cold stage of ague, when a patient may have a temperature of 105 while his teeth are chattering with cold.

I entirely agree with Dr. Marcet that it is the fact of actively climbing and not the actual elevation, which influences the temperature. When sitting quiet on the top of Whernside and Gragreth the temperatures were at or above the normal. The steepness also appears to have great influence; both these mountains have flattish tops, and the temperature on reaching the top of Whernside shows less depression than during the ascent, while that taken walking on the flat top of Gragreth, though without stopping, after the ascent showed scarcely any.

I noticed no depression of temperature in descending, though I often came down at a run, and none in several long level walks.

And now as to any possible fallacies. The same thermometer was used in all the observations. It is a Philips' maximum, by Wood and Co., of York, is graduated in fifths of a degree, and easily reads to tenths. I have compared it with a thermometer certified at Kew, and find it very exact. It rises to within a degree of the truth in ten seconds after putting under the tongue, and I am accustomed to rely on its indications after being in about two minutes. In all the above observations it was left in the same position under the tongue five minutes by the watch (except the reading at 2.33, when it was only four); consequently any failure to rise to the true temperature would be likely to affect all the readings nearly alike. Whatever error may be due to this cause would be likely to show itself in raising the readings during the ascents, as at these times the heart was beating strongly and the circulation particularly active; so that the cooling of the mouth by the cold bulb would be quickly neutralised. I was also particularly careful not to allow any air to enter through the lips and as little as possible through the fauces, and feel confident that there is no appreciable error from this cause.

As to the *rationale* of the process, may not the following theory embrace all the facts as observed by Marcet, Forel, and others?

Heat motion and chemical force are merely varieties of one force convertible under certain conditions. The human body is an engine, in which muscle and other tissues are oxidised, and the resulting chemical force is transformed into an equivalent amount of motion and heat. Now it is manifest that there is a limit to the rate at which oxidation can go on in the body, and consequently to the amount of force available for transformation in an unit of time into motion and heat. Usually the human machine is not worked up to its full power; the amount of motion produced is nothing approaching what is possible, and only sufficient force is transformed into heat to keep the body at the normal temperature of 98·4; but in the limit the two processes become complementary to each other, and if from any cause the force converted in one direction exceeds a certain amount, the excess can only be obtained at the expense of what would ordinarily be converted in the other. Now, in mountain climbing the amount of motion as expressed in foot-pounds of work done is very great, and much exceeds the amount to which most of us are accustomed in walking on a level road. If this be pushed to the limit it encroaches on the amount of force destined for the supply of heat to the body, and the temperature falls. It is clear that these processes habitually go on at different rates in different individuals; if so, may not the limit of the rate of tissue change be different? One man may be able to push his motion production nearly to the limit up to which his oxidation will work, thereby encroaching on what ought to sustain his temperature, while another, whose muscles are less fully under the dominion of his nerves, or whose power of oxidation is considerable, may be unable to reach that limit.

To this class I believe Dr. Forel to belong; in the other, the slow oxidisers, I find myself in the honourable company of Drs. Marcet and Lortet.

TEMPEST ANDERSON

17, Stonegate, York

Trevandrum Magnetic Observations

THOUGH I have felt much gratified with the notice by Prof. B. Stewart of the first volume of the "Trevandrum Observations" which appeared in last week's NATURE, p. 163, I desire, nevertheless, to make a few remarks on the only point on which we appear to differ.

There are two methods of investigating the laws of magnetic disturbance, which have quite distinct objects; one, which has been employed with much success by that eminent veteran of science Sir E. Sabine, seeks, as he has expressly stated, the laws of the *larger* disturbances only, and for this end chooses only those deviations from the mean positions that are greater than some arbitrary value. The other method seeks the laws of disturbances of *all* magnitudes, and employs deviations of *all* amounts.

As Prof. Stewart regrets that I have employed the latter method, and suggests that the former may yet be used by others,

it may be supposed that the laws of disturbance are not found by me, and are not to be found by the method which I have employed. This would be a great mistake; one which I am bound to correct.

The method which Prof. Stewart recommends has had objections proposed to it by the Astronomer Royal, the Provost of Trinity College, Dublin, and by myself. It is, I think, to defend the method against these objections that Prof. Stewart has written his remarks on the modes of discussion; but I have never heard any objections to the other method, nor, as far as I can understand, does he offer any.

As the method followed by Dr. Lloyd on the Dublin Observations and by myself on the Makerstoun and Trevandrum Observations has shown every law of magnetic disturbance that has been obtained by the other, I am afraid I cannot see that the illustration of the cyclones is applicable to the two methods, even if we were bound to study large cyclones only and to put those of less than a given magnitude out of consideration.

4, Abercorn Place, London, N.W. JOHN ALLAN BROUN

Anomalous Behaviour of Selenium

IT has been lately observed that the electrical resistance of selenium is greater in the light than in the dark. It was at first thought possible that this increase of resistance might be due to heat admitted with the light, but Prof. W. G. Adams, in his paper read before the Royal Society, June 17th, 1875, has shown that this is not the case, but that the phenomenon is a purely optical one.

The writer of this letter has to-day tried an experiment with a selenium bar belonging to the Cavendish Laboratory. Its length is 50 mm., breadth 8 mm., thickness about 1 mm.; platinum wires are soldered to its ends, and it has a hard metallic surface. Its electrical resistance is enormous. In the dark it is just over 100 megohms (100,000,000 B.A.U.) When, however, the light of the paraffin lamp of the galvanometer was allowed to fall on it from the distance of about a foot, the resistance DECREASED between 20 and 30 per cent. The experiment was repeated many times, with current sent sometimes one way, sometimes another, and with different sides and edges of the bar turned to the light, but always with the same result, namely, that the effect of letting in the light was to largely *decrease* the resistance.

A second set of experiments were made with a selenium medal struck by Berzelius soon after the discovery of the metal in 1818, and presented by him to Mr. Deck, by whose son, Mr. Deck of Cambridge, it was kindly lent for the experiment. This medal was of oval shape, about 40 millims. long by 30 broad. Owing to the difference of form between the two specimens, their specific resistances could not be accurately compared; that of the medal was, however, not more than about $\frac{1}{40}$ of that of the bar. The medal was exactly like black lead both to touch and sight, and quite different in appearance to the bar. The resistance of the medal *was sensibly the same, both in the dark and in the light; no difference could be detected.*

These experiments seem to show that the physical form of the metal has a great deal to do with its behaviour when carrying an electric current and exposed to light.

J. E. H. GORDON

Cavendish Laboratory, Cambridge, June 29

The House-fly

As no one more competent than myself seems disposed to reply to the query of "Harrovian" (NATURE, vol. xii. p. 126) respecting a disease of the house-fly, and which is again referred to by the Rev. D. Edwardes in last week's NATURE, I may perhaps be permitted to make a few remarks thereon.

I have frequently noticed dead and dying flies thus affected, generally in the late summer and autumn; and I think I am right in attributing the phenomenon to the growth of a parasitic fungus, called, I believe, *Empusa musci*, in the fly's body. The insects may often be seen settled in a natural position on window-panes, but with the abdomen much distended, and surrounded by a collection of whitish powder, extending for a few lines in all directions on the surface of the glass. The whole of the interior organs of the abdomen are consumed by the plant, nothing remaining but the chitinous envelope, on which the mycelia of the fungi form a felt-like layer; the fructification showing itself externally as filaments protruding from between the rings of the body.

Insects are very subject to the attacks of such parasites. Some of those living in the interior organs of the body seem to do little if any injury to their "hosts," while others completely destroy them; as in the case of *Sphæria*, which changes the caterpillars at whose expense it lives into a mass of fungoid growth of most grotesque appearance. It is now well ascertained that a species of *Botrytus* produces the dreaded "Muscardine" of the silk-growers; and every practical lepidopterist has had to lament the destruction of pet broods of larvæ by some similar disease, which, though perhaps sometimes pathological, is probably in the first instance set on foot by fungi.

The whole subject of the parasites of insects is extremely interesting. According to my experience it is the exception for an insect to be quite exempt from the attacks of one or more animal or vegetable entozoic or epizoic organism; and I have often found five or six different species inhabiting one unfortunate individual.

I may mention that "Harrovian" will find some remarks on this fly-fungus by Dr. Cohn, in an early volume of the *Journ. Micros. Science.* I regret that, writing away from home, I cannot give the exact reference. W. COLE

Stoke Newington, N., July 2

[We print this letter from among several which all correctly explain the phenomenon under consideration in a similar manner.—ED.]

Theories of Cyclones

IN NATURE, vol. xii. p. 98, you notice a paper by Dr. Hann on two rival theories of cyclones. According to one, "whirlwinds are formed mechanically by different streams of air meeting, and centrifugal force causes the central depression. The more modern theory regards a local depression as the first condition, causing an indraft resulting in a whirlwind through the earth's rotation: the primary depression is held to follow condensation of vapour."

The question is how the cyclone begins: whether the first depression is due to the centrifugal force of an eddy, or to the expansion of air in the upper strata from the heat liberated in the condensation of vapour. There need not be any controversy as to the dynamics of the cyclone after it is formed.

There is a mass of geographical evidence in favour of the first-named theory, namely, that cyclones originate in the conflict of the trade-winds of the northern and southern hemispheres when either trade-wind is drawn to some distance across the equator. (A cyclone cannot be formed on the equator, because there the earth has no rotation in relation to a vertical axis). On this subject see Mr. Meldrum's paper in NATURE, vol. ii. p. 151, and my letter in NATURE, vol. iv. p. 305; also Mr. Maury's paper in NATURE, vol. viii. pp. 124, 147, 164.

Mr. Maury fully recognises the truth that the motive power of the cyclone, once it is formed, consists in the heat liberated by the condensation of vapour, which causes expansion in the upper strata and produces an ascending current. I believe the nature of these actions was first explained by Espy, whose "Philosophy of Storms," though well known by name, seems to be less appreciated than it deserves.

There is, however, another reason for the existence of an ascending current at the centre of a whirlwind, which I do not think I have seen stated. The lowest atmospheric stratum of a whirlwind is retarded in its motion by friction against the earth, and its centrifugal force is thereby lessened in proportion to that of the upper strata. The effect of this relative deficiency of centrifugal force in the lowest stratum—that is to say, at the surface of the earth—must be to cause a flow of air at the surface of the earth towards the centre of the whirlwind, and an ascending current at its centre. Such an ascending current is probably the cause of the vertical columns of dust that accompany those small whirlwinds which are common in windy weather.

Old Forge, Dunmurry, Co. Antrim, June 23 JOSEPH JOHN MURPHY

The Dark Argus Butterfly

IT is stated in H. N. Humphrey's work on "British Butterflies," that the Dark Argus Butterfly appears in July, and has only been found in the neighbourhood of Durham and Newcastle, and seldom above half a mile from the sea. When in May I was at Ashmore, which is on the borders of Dorset and Wilts, I took some butterflies answering exactly to the description of

the Dark Argus in Mr. Humphrey's book; so would you kindly inform me whether this is a new locality, and whether there are two broods, the first in May and the second in July, as is the case with several of family, as would appear from the above statements? I identify the species with his Dark Argus by the following peculiarities, viz.: (1) an obscure black spot near centre of fore-wings; (2) *no* black spots in the orange ocelli in fore-wings, the hind-wings containing these black spots as in the Brown Argus. JOHN HODGKIN, JUN.

West Derby, near Liverpool

Meteorological Phenomenon

WHILE walking out yesterday afternoon my attention was drawn to a very remarkable display of mares-tail clouds spreading from the north, stretching in broad and narrow bands in every direction over the whole sky, and reaching beyond the zenith. While standing thus facing the sun, I saw, at a great elevation, a coloured bow with its convex red side towards the sun; it was only about one-sixth or one-seventh of a circle, and its width seemed to be only about half that of an average ordinary rainbow. It had the appearance of being nearly horizontal, with its centre not far from the zenith, but probably not so distant. Not being accustomed to estimate elevations, when I got home I took a quadrant and held it about the elevation of the part of the bow nearest the sun, and found it came out, on repeated trials, at a *zenith distance* of 25° or 26°.* When I first saw the bow it was just 6h. 30m. P.M. Greenwich time, and the sun appeared to be about 15° above the horizon (that you can correct by calculation). The sun was shining brightly, and the bow was projected over a patch of sky slightly dimmed, at a great height (but below the cirri?), by a smoke-grey haze; its ends just projected over the edges of the clouds. It lasted about 2m. and then faded away. There was no halo or ring but this. The wind was a rather fresh breeze, between S.S.E. and S.

Norwich, June 28 HENRY NORTON

OUR ASTRONOMICAL COLUMN

SÛFI'S DESCRIPTION OF THE FIXED STARS.—The author of the ancient Uranometria to which we adverted last week, Abd-al-Rahman al-Sûfi (an abbreviation of a much longer name), was born in 903; he was of the sect of the Sûfis, and of Rai, a place to the east of Teheran. He was in high favour with Adhad al-Davlat, of the reigning family of Persia, and it was principally for the instruction of this prince that he wrote the work under notice, which was not the only one he produced. Ibn Jounis reports that he was not only an observer, but framed astronomical tables; and Dr. Schjellerup states he is known to have undertaken geodetic operations. He is said to have determined the length of the year, and in his tables fixes the mean motion of the sun in the Persian year at 359° 45′ 40″·2. He died in May 986. The prince Adhad al-Davlat, who gave great encouragement to the study of the sciences, commenced his reign in 949, and at the time of his death, in 983, governed the extent of country situate between the Caspian and the Persian Gulf.

The translation of the "Description of the Fixed Stars" by Sûfi was made by Dr. Schjellerup from a manuscript preserved in the Royal Library at Copenhagen, which came into the possession of Niebuhr in 1763. It is a copy made in 1601 from a manuscript transcribed in 1013, and, as stated by Schjellerup, "directement d'après l'exemplaire de Sûfi." The translation was finished when the Danish astronomer, through Herr Dorn, had the opportunity of consulting another copy of Sûfi's work, recently acquired by the Imperial Library of St. Petersburg. Where differences exist between the two authorities, they are particularised in notes to Schjellerup's translation.

The description of the stars by Sûfi, though founded upon that of Ptolemy, is not merely a simple translation. All the stars contained in Ptolemy's catalogue were sought in the positions there recorded, and submitted to attentive examination, and their magnitudes carefully noted, as is distinctly stated by Sûfi in his preface. Schjellerup draws attention to the great extent of his work, the perseverance displayed, and the minute accuracy and scientific criticism with which the whole is executed; so that, under all circumstances, the Persian astronomer has presented us with the state of the sidereal heavens in his time, which merits the highest confidence, and which during nine centuries remains without a rival, not having found its equal till the appearance of the "Uranometria Nova" of Argelander.

Prefixed to the description of the constellations, Schjellerup has published what he terms "Tableau synoptique de l'intensité lumineuse des étoiles principales selon Ptolémée (ou Hipparch), Sûfi et Argelander," which is obviously a valuable compilation, and one that may be frequently consulted in cases where the naked-eye stars are suspected of variability. The magnitudes attributed to Ptolemy are not those given in our editions of the "Almagest," but are taken from the work of Sûfi; indeed, Schjellerup considers the former "parfaitement inutiles," being expressed in round numbers and with much confusion, so that in this respect also we have an important addition to our knowledge of the magnitudes of the stars.

In Sûfi's tables of positions, the longitudes of the Almagest are increased 12° 42′, the latitudes being unaltered.

Generally speaking, there is a fair agreement between the magnitudes of Ptolemy and Argelander, the differences not often exceeding a degree of the scale. Amongst the larger discordances Schjellerup points to the cases of 25 Orionis and ρ Eridani, estimated by Ptolemy of the third and fourth magnitudes respectively, while by Argelander they are called a bright fifth and a sixth. Sûfi's estimates in the middle of the tenth century are intermediate, the first star being rated a fourth and the second a fifth magnitude. The case of Sirius is worthy of attention for another reason. Cicero, Horace, and other classical writers refer to the ruddy colour of this star. In the editions of Ptolemy it is indicated as ὑπόκιρρος, but Sûfi makes no mention of this reddish tinge, though, as was stated last week, other stars well marked as red stars in our own day, are also so distinguished in his description of the heavens. Instead of reading with Halma καὶ ὑπόκιρρος, Schjellerup thinks we should more correctly read καὶ σείριος, conformable to the designations which Ptolemy gives to the other bright stars which bear a proper name, as with α Bootis (ἀρκτοῦρος), α Leonis (βασιλίσκος), &c.; and remarks that it is certain Cicero was the first who mentions the ruddiness of Sirius, that Horace followed him, and that after Seneca we find no reference to it. Eratosthenes, Aratus, Manilius, Hyginus, and Germanicus are silent as to this particularity of the star.

The great nebula in Andromeda is named by Sûfi as an object generally known in the heavens, and it is interesting to note that he also records the variable star recently detected by Herr Julius Schmidt near α Virginis. Its position is very clearly described.

The title of Schjellerup's translation is "Description des Étoiles Fixes, composée au milieu du dixième siècle de notre ère, par l'Astronome Persan Abd-al-Rahman al-Sûfi, par H. C. F. C. Schjellerup, St. Petersbourg, 1874." It was presented to the Imperial Academy in June 1870.

SOLAR RADIATION AND SUN-SPOTS

SINCE I communicated to NATURE the first results (vol. xii. p. 147) of an examination of the Indian registers of solar-radiation temperatures, I have examined some other registers, all of which confirm the conclusion adumbrated in my former note. Among these the most interesting and striking is the hill station Darjiling, in Sikkim, nearly 7,000 feet above the sea. The place is very cloudy, being on the outer Himalayan range, and much

* Subtended at my eye by bow and sun = about 50°?

exposed to the moist southerly winds, but it has two advantages over the stations in the plains, viz., that there are nearly 7,000 feet less atmosphere above it, and it is free from the dust haze, so prevalent on the plains, which perhaps more than water vapour (if not thickly condensed) stops a large part of the solar radiation. On clear days and in intervals between the clouds, the sun's heat is sometimes very intense. The table that follows has been compiled in a different manner from that which I communicated a fortnight since. Instead of picking out days with little or no cloud (which are sure enough during the greater part of the year), I have taken the three highest recorded sun-temperatures in each half-month, and from these have deducted the maximum air-temperatures recorded on the same days; the mean of the six observations being taken to represent the month. The same instrument has been in use since the observations were commenced in April 1870. I must leave it to meteorologists at home to compare these temperatures with the recorded sun-spot areas, which I am unable to ascertain. But the maximum radiation temperature evidently falls in 1871, the year of maximum spots, and the increase on that of the imperfect year 1870, and the fall in the subsequent years, at least up to the end of 1874, are very marked.

Mean differences of the three highest solar temperatures in each half-month and the corresponding maximum air temperatures at Darjiling.

	1870.	1871.	1872.	1873.	1874.	1875.
January	—	57·8	67·7	59·2	57·8	62·3
February	—	62·2	62·8	62·3	56·5	60·3
March	—	63·3	63·5	62	58·2	57·8
April	—	64·2	63·2	62·8	55·7	60·2
May	62·2	67·8	66·8	63·8	57·8	—
June	67	68	67·3	62·5	59·2	—
July	63·3	66·2	65·7	60·8	56·3	—
August	70·8	65·7	66·8	60	57·8	—
September	71·5	69·3	63·7	62·3	59·3	—
October	65·5	68·2	70	63·3	60·8	—
November	62·5	67·3	62·5	57·3	63·3	—
December	59	66·3	59	53·8	60·5	—
Yearly means	—	65·5	64·9	60·8	58·6	—

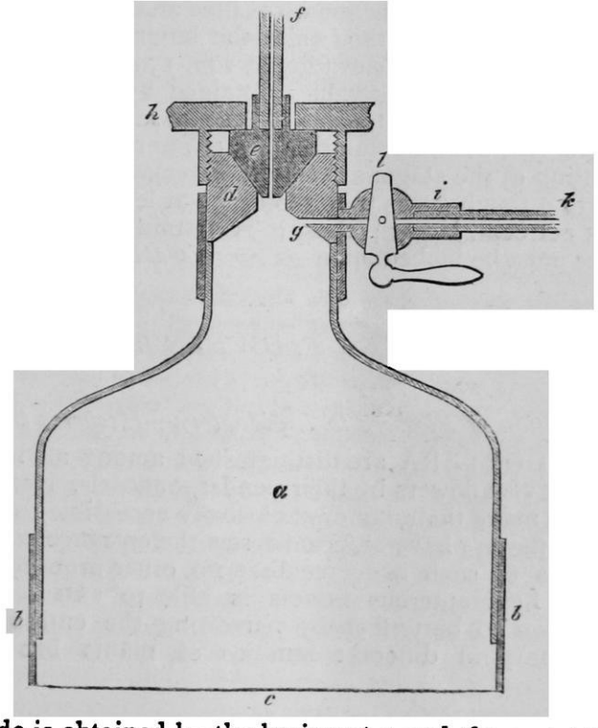
In my former note I adverted to Prof. Köppen's results on the variation of the temperature of the lower atmosphere in the tropics, which he showed to be inversely as the number of the sun-spots or nearly so, from 1820 to 1858. On thinking the matter over, this result, however anomalous at first sight, appears to me really only in conformity with what might be expected when taken in connection with the facts of the rainfall. Since three-fourths of the earth's surface are covered with water, the chief effect of increased radiation must necessarily be to increase the evaporation, and therefore the cloud and rainfall. The former of these will intercept a larger proportion of the solar heat and prevent its reaching the ground; while the latter, by its evaporation from the land surface, will still further reduce the temperature. The annual curves of temperature at the Bengal stations show most strikingly how the temperature falls with cloud and rain. A single heavy storm without any change in the prevalent wind direction reduces the temperature by several degrees for two or three days after the fall; and the same fact is illustrated in the mean annual curve, which falls considerably on the setting in of the rains, while there is generally a slight rise in September when the rains draw to a close. It follows, then, that the whole increase of the sun's heat and something more, in the tropics, is absorbed in evaporation and by the upper strata of the atmosphere, thus affording a confirmation of the speculation of (I think) Sir John Herschel, that the inferior planets (if partly covered by water) may enjoy an equable moderate temperature fitted for the existence of such terrestrial organisms as can thrive under a sombre sky.

June 7 H. F. BLANFORD

SCIENCE IN GERMANY

(From a German Correspondent.)

BUNSEN'S ice-calorimeter was used lately for a very interesting experiment by Messrs. Röntgen and Exner, who tried to determine the intensity of the radiation of the sun by means of an apparatus constructed on the principle of that calorimeter. The apparatus consists of a glass bell *a* of 75 mm. height. This is fastened into a brass hoop *b*, which is closed below by a plate of wrought silver of ¼ mm. thickness, and 106 mm. diameter. The neck of the bell bears a massive brass top *d*, which is cut conically above and below, and has a central opening of 6 mm. diameter. Into the exterior groove a massive brass cone *e* fits water-tight, having also the central boring, into which a little glass tube is fastened. By a screw *h* in the circumference, the cone *e* can be firmly pressed against the brass piece *d*, while the tube *f* communicates with the interior of the bell *a*. A second communication between the interior of the bell and the



outside is obtained by the boring at *g* and the metal-tube *i*, with stopcock *l*.

When the apparatus is to be used as a pyrheliometer, the bell is filled with well-boiled distilled water, and the whole is frozen like one of Bunsen's calorimeters. To the tube *f* a long glass tube of perfect calibre and with millimetre divisions is fastened by means of a piece of india-rubber tubing; to the end *k* of the brass tube with stopcock an indiarubber ball filled with well-boiled water is then fastened, the stopcock opened, and while the apparatus is held vertically, all air which may still be contained in the bell is removed from it through the cone *e*, the tube *f*, and the divided tube, so that the latter is filled with water up to its end. Then the stopcock *l* is closed. If beforehand the silver plate has been carefully covered with soot, the apparatus is ready for use. It is directed towards the sun just like Pouillet's pyrheliometer, so that the sun's rays fall vertically upon the blackened plate. The divided tube is then supported as much as possible in a horizontal position, and the progress of the column of water in the same is observed with a second clock from minute to minute. This progress of the

column of water would indicate directly the intensity of the radiation of the sun in calories if the ice did not also partly melt in consequence of the surrounding warm air. In order to eliminate this influence, the progress of the column of water must be observed before and after the actual experiment, and during these observations the sun's rays must be shut out from the apparatus by a screen. The difference of the readings with and without the sun's rays will then indicate the density of the latter. But this method has a drawback. It was found that with experiments which were made in quick succession, when the apparatus was exposed to the sun's rays, that the first results were always a little larger than the following ones, and that only after some time had elapsed did the results show a constant value. The reason of this is doubtless the formation of a stagnant layer of water in the apparatus below the blackened plate, and this layer must first reach a stationary position before anything like regularity is obtained in the results.

With regard to the general results of these experiments, which were made by Messrs. Röntgen and Exner on the platform of Strassburg Cathedral, the absolute values of the intensity of the radiation of the sun are considerably larger than those found by Pouillet. If Pouillet's values are reduced to the same measures and units, which form the basis of the values obtained by Röntgen and Exner, we find, for instance, for the month of June and the sun's elevation 12h. the value 1·140, while the latter observers still obtained 1·226 for an elevation of 12h. 15m. Further, we must remark that the values obtained by Röntgen and Exner are decidedly too small (the observations record the progress of the column of water after the stationary condition of the stagnant layer of water), and that according to a rough guess they should be at least 20 per cent. to 25 per cent. larger; thus it is certain that Pouillet's values must be looked upon as *considerably too small.*

*FERTILISATION OF FLOWERS BY INSECTS**

XI.

Adaptation of Flowers to Lepidoptera—Hesperis tristis.

LEPIDOPTERA are distinguished among all insects that visit flowers by their slender proboscis. Hence, in order to make their honey exclusively accessible to these insects, flowers have only to narrow the entrance to their nectaries to such a degree that no other proboscis but that of Lepidopterous insects is able to enter. This adaptation to butterflies by narrowing the entrance of the nectary in different families of plants has been

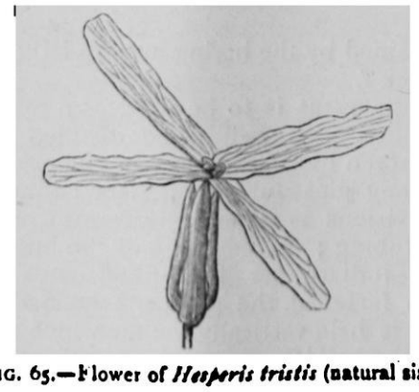


FIG. 65.—Flower of *Hesperis tristis* (natural size).

arrived at in very different ways. In flowers with a tubular corolla (*Primula villosa*, *Daphne striata*, NATURE, vol. xi. p. 110, Figs. 43-47) the corolla-tube has narrowed; in flowers with a honey-secreting spur (*Gymnadenia*, *Nigritella*, NATURE, vol. xi. p. 170, Figs. 58-62) the entrance of the spur has been constricted; in the labiate flowers of *Rhinanthus alpinus* (NATURE, vol. xi. p. 111, Figs. 51-56) the large entrance of the flower is blocked up by the margins of the upper lip lying close together, and only a small opening in its rostrate projection has been left open; in the quite open flowers of *Lilium Martagon* (NATURE, vol. xii. p. 50) the honey-secreting furrow at the base of the sepals and petals has been converted into

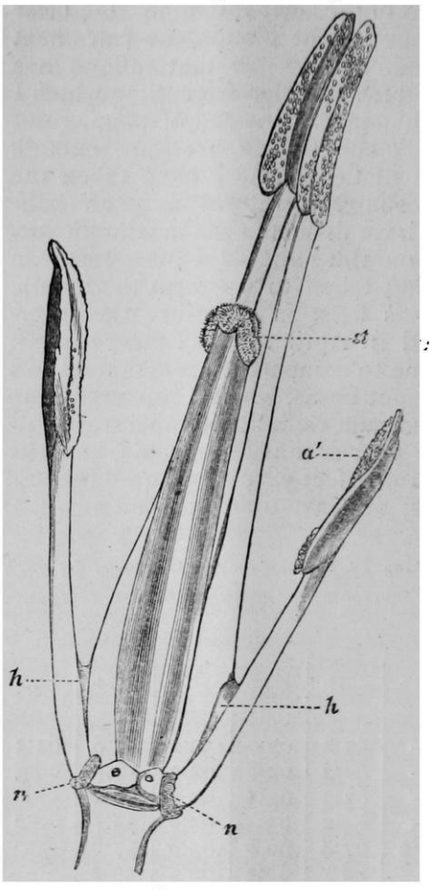


FIG. 66.

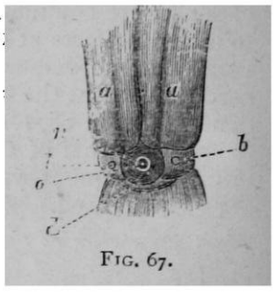


FIG. 67.

FIG. 66.—The same after the sepals, the petals, and two of the four longer anthers have been removed. *n*, nectary; *h*, honey; *a'*, shorter anther; *st*, stigma.

FIG. 67.—Situation of the nectary. *a a*, longer filaments; *o*, point of insertion of one of the shorter filaments; *b b*, points of insertion of the two adjacent petals; *d*, insertion of the adjacent sepal; *n*, nectary.

a narrow channel by a coating of glandular hairs. *Hesperis tristis*, belonging to the family of Cruciferæ, which are generally visited for honey by Apidæ, Syrphidæ, Muscidæ, and various other insects, has excluded from its honey all visitors except Lepidoptera, by simply lengthening its sepals and the basal portion of its petals and laying them close together. The sepals, indeed, as is shown by Fig.

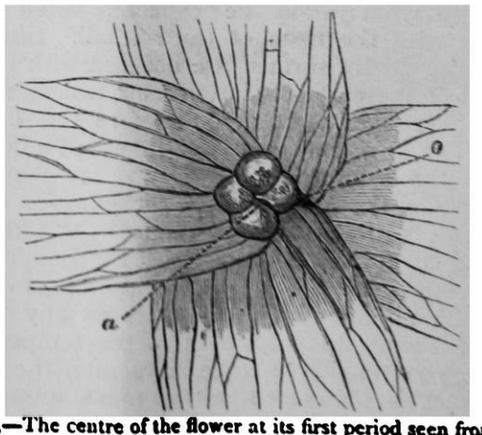


FIG. 68.—The centre of the flower at its first period seen from above. *a*, longer anthers; *o*, openings.

65, are elongated to 11-15 mm., and whilst diverging and presenting open slits in their basal portion, are convergent and connate towards their tips. By this coalescence of the sepals the entrance of the flower is so constricted as to be almost completely filled up by the four longer anthers (*a*, Figs. 68, 69). At first, when the

* Continued from p. 50.

flower has just opened, only a single very small opening is commonly left free (*o*, Fig. 68); somewhat later, when the longer anthers have advanced a little further, two small openings are frequently obvious (*o o*, Fig. 69), by which Lepidoptera can insert their proboscis. The exclusion, however, of all other insects from the honey would be useless or even fatal to this, as well as to the above mentioned flowers, unless by particular contrivances, (1) increased frequency of the visits of Lepidoptera,

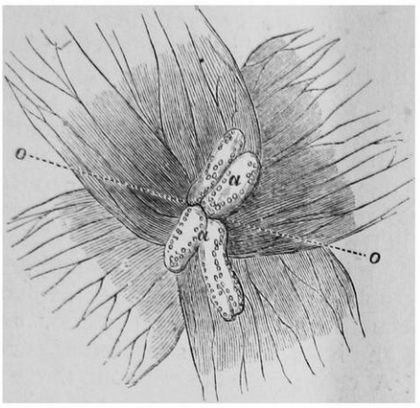


FIG. 69.—The same, at a somewhat later period.

and (2) certain cross-fertilisation by them were effected. *Hesperis tristis*, by the very inconspicuous colour of its flowers, which are yellow reticulated with purplish streaks, by opening them in the afternoon, and by having no smell in the daytime whilst very fragrant towards the evening, proves to be adapted exclusively to crepuscular and nocturnal Lepidoptera, which, attracted from afar by the sweet odour, are induced to pay frequent visits. The base of each of the two shorter filaments is surrounded by a greenish swelling (*n*, Figs. 66, 67), which secretes on its inside honey so copiously that it rises in the interstice between the shorter and the two adjacent longer filaments. Cross-fertilisation by the visits of moths is secured in the following manner. From the one or two small openings (*o*, Figs. 68, 69) the proboscis of the moth is guided downwards by the longer filaments as in a channel, first along one side of the stigma (*st*, Fig. 66), which has bent downwards on both sides just into the way of the proboscis, then

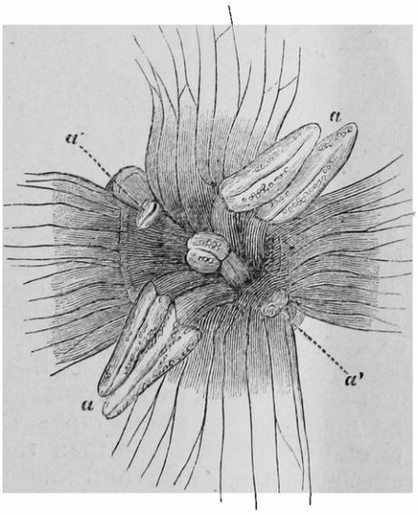


FIG. 70.—The same in its last state.
(Figs. 66–70 are seven times magnified.)

along the shorter anther (*a'*, Fig. 66), which from the other side has turned its pollen-covered front likewise exactly into the way of the proboscis, until at last it reaches the honey (*h*, Fig. 66); the proboscis afterwards wetted with honey at its tip, when retracted, first touches again the anther *a'* with one side, which is thus charged with pollen, then with the other side the stigma, which thus escapes fertilisation with its own pollen, and when in the next visited flower the tip of the proboscis with its pollen-charged side touches the stigma, cross-fertilisation is effected.

My daughter Agnes, perseveringly watching *Hesperis tristis* during several mild evenings in the month of May, has succeeded in observing and catching the following fertilisers of it:—(1) *Plusia gamma*, frequently (length of the proboscis 16-18 mm.); (2) *Hadena sp.* (11 mm.); (3) *Dianthœcia conspersa*, W.V., twice (13 mm.); (4) *Iodis lactearia*, L.; (5) *Botys forficalis*, L., three times.

But although in calm and warm evenings, as is proved by these observations, cross-fertilisation may be sufficiently effected; yet in unfavourable weather all flowers of many individuals develop and fade without experiencing any visit of fertilisers. In this case, nevertheless, almost every ovary develops and brings to maturity its seed-vessels, self-fertilisation being regularly effected by the pistil growing and the stigma coming into contact with pollen-grains of the four longer anthers.

Thus, in these flowers the four longer anthers have apparently no other function in the first period of flowering but to exclude incompetent visitors from the honey, by stopping the entrance of the flower, and, by the direction of their filaments, to keep the proboscis of the fertilisers in the right direction, whilst in a later period, in case visits of moths have been wanting, they regularly effect self-fertilisation. The two shorter anthers, on the contrary, are exclusively adapted to cross-fertilisation by visiting moths.

Lippstadt HERMANN MÜLLER

JOSEPH WINLOCK

THE following details concerning the late Prof. Winlock, whose death we announced last week, we take from the New York *Nation*:—

Prof. Joseph Winlock, Director of the Observatory of Harvard College, died suddenly after a brief illness last Friday morning, June 11, at the age of forty-nine. One of the foremost of American astronomers, whose honourable career in science began thirty years ago, who has filled with great credit several important positions of scientific labour and trust, is thus cut off in the midst of a life whose usefulness cannot be estimated by ordinary standards. Well known and highly estimated by all active collaborators in astronomy both at home and abroad, he was never so well known to others or to the public as his important services deserved. This was chiefly on account of a modest shrinking from any candidacy for honours, amounting almost to an aversion from them, and an indifference to an uncritical or merely popular reputation. Immediately upon graduating from Shelby College, Kentucky, in 1845, he was appointed Professor of Mathematics and Astronomy in that College, where he remained until 1852, when he removed to Cambridge, Mass., and took part in the computations of the *American Ephemeris and Nautical Almanac*, then under the superintendence of Admiral C. H. Davis. In 1857 he was appointed Professor of Mathematics of the United States Navy, and in that capacity served in succession as Assistant at the Naval Observatory at Washington, as Superintendent of the *Nautical Almanac*, and as Director of the Mathematical Department of the Naval Academy at Annapolis, Md. On the breaking out of the war, in 1861, he was a second time made Superintendent of the *Nautical Almanac*. His next service to astronomy was in the position of Director of the Observatory at Harvard College, and Phillips Professor of Astronomy, to which he was appointed in 1865 a position already made highly honourable by the labours of his predecessors, the distinguished astronomers, Professors W C Bond and G. P Bond. He has also served at the same time as Professor of Geodesy in the Mining School of Harvard College. Only a few months ago, Mr. Bristow appointed him the chairman of the Congressional Commission for

Investigating the Causes of Steam-Boiler Explosions. These many appointments to places of responsibility are evidences of the rare sagacity, skill, sound judgment, and integrity of character which were qualities conspicuous to all who knew him well or dealt with him in his various duties. Upon taking charge of the Cambridge Observatory, he proceeded with energy to complete its equipment, adding to its already famous resources a meridian circle, constructed in accordance with his designs by Throughton and Simms of London—an instrument whose performance has been pronounced by competent judges the best of its kind in the world. The distinguished astronomer, Adams, of Cambridge, England, subsequently ordered an instrument from the same makers to be constructed on the same model. Prof. Winlock also secured for this Observatory a very perfect astronomical clock, made by Frodsham of London, from which, through contrivances of his own, true time is telegraphed to neighbouring cities. He also set the famous equatorial instrument of the Observatory upon a new career of usefulness and glory in astronomical spectroscopy. In 1870 he put into regular working efficiency a mode of observing the sun—namely, by a single lens, a heliostat, and photograph—which he independently conceived, and was the first to utilise as a form of systematic observatory work. French astronomers have lately been contending with one another about priority in the conception of this method of observation, which was so important a part of the equipment for observing the transit of Venus last December furnished to American expeditions; but in all that really constitutes effective originality, the honour of this invention undoubtedly belongs to Prof. Winlock. He was, however, almost entirely indifferent, in the singleness of his devotion to his favourite science, to popular fame, or even to contemporary recognition. Besides his observatory work, he was engaged on two occasions in the direction of expeditions to observe solar eclipses—namely, that to Kentucky in August 1869, and that to Spain in December 1870. Though ingenious as an inventor, his judiciousness was so much more prominent a quality that his originality is shown rather in a thoroughness and detailed efficiency of contrivance than in the more brilliant qualities that distinguish the more famous inventors. Very numerous little but very effective improvements in astronomical methods distinguish the astronomical art of the present day; and in these Prof. Winlock's originality was considerable. Among his published works, besides the "Annals of the Observatory" under his directorship, are a set of tables of the planet Mercury (arranged with characteristic neatness and ingenuity); brief papers in astronomical journals and in the *Proceedings of the American Academy of Arts and Sciences*. He was a native of Kentucky, and the grandson of General Joseph Winlock, who entered the American army at the beginning of the Revolutionary War, and also served in the war of 1812, and was a member of the convention which drew up the constitution of the State of Kentucky.

INDIA MUSEUM, SOUTH KENSINGTON

THE India Museum, which was opened in South Kensington last month, was founded by the Court of Directors of the Honourable East India Company in 1798. In 1860 it was removed from Leadenhall Street to Fyfe House, and in 1869 to the India Office. The galleries of the Exhibition Building, in which it is now temporarily lodged, have been leased from H.M. Commissioners for the Exhibition of 1851 for three years. The lower gallery is devoted to Raw Products, and the upper gallery to Manufactures. The present arrangement of the India Museum Collections is to a large extent only temporary, and fulfils mainly the purpose of bringing them into view preparatory to their final classification. The preparation of Descriptive Catalogues will go hand in hand with the completion of the different groups.

A handy little penny Guide has in the meantime been officially issued, which will be found of considerable service in enabling the visitor to make a systematic inspection of the large collections which have been for so long stowed away in various cellars and ware-rooms in the topmost story of the New India Office. Now that this Museum has been brought "to the light of common day," and that the public has a chance of estimating the value of its treasures, we are sure that when the lease of the Exhibition rooms expires, permanent accommodation will be allotted to it, we hope in connection with an India Institute so ably advocated by the Director of the Museum, Dr. Forbes Watson. On four days of the week the charge for admission is only one penny, and sixpence on the other two days. We purpose at present to give some account of the Botanical and Zoological Collections in the Museum.

Room No. 1 is devoted to the commercial products of the vegetable kingdom, with the mechanical appliances associated with their cultivation, collection, or preparation, and is under the superintendence of Dr. M. C. Cooke. A complete collection of these products is exhibited in small tin cases with glass fronts, which are arranged in metal frames, and suffice to give a general view of the productions of the country. Supplemental to this the principal trade articles receive special illustration in a more extended manner in central cases. As this is a new feature in the arrangement of this section, it will take some time before it can be fully and properly developed. What has been done with cotton will in part illustrate what is intended with other products. In this instance the cotton is shown from all parts of India, at first in the boll, then in the seed; afterwards cleaned, together with the seed and oil therefrom, with the waste obtained in the processes of cleaning and spinning and its economic applications. The processes of spinning are next illustrated, with the resultant twists and yarns. These are succeeded by grey and bleached cloth, printing blocks, samples of dyed and printed fabrics, and coloured yarns. Underneath these cases are arranged the agricultural implements employed in the cultivation of cotton, churkas and rollers for cleaning it from the seed, models of spinning wheels and other appliances illustrating the manipulation of the cotton fibre. Above the cases are displayed drawings of the varieties of cotton plants, and of the natives at work at the different processes through which the cotton passes from the ploughing of the soil to the complete woven fabric. By this mode the whole history of the progress of cotton from first to last is exhibited at one view, or at least as much of it as could be compressed within available space. Hitherto, although agriculture, and especially its food products, has been fully illustrated, forestry has not had by any means the share which its importance demands. It is contemplated therefore to expand this new division considerably by the addition of collections of the timbers of the three presidencies and of native states, each by itself, so as to show the character of the forests in each division, accompanied by maps and drawings or photographs of the trees. The products of the forests, other than timber, will be shown collectively for the whole of India, accompanied by such diagrams, drawings, and statistical tables as may be necessary; and the fungoid pests and enemies of arboriculture will also be illustrated. Already this illustrative mode of exhibition has commenced, but will evidently proceed slowly, as diagrams, drawings, and tables will have to be constructed, and probably some of the illustrations must be obtained direct from India.

It may be remarked that Cinchona Bark from the Neilgherry plantations, as well as from Kangra, has the honour of a case to itself, and it is hoped that soon another important drug recently introduced—Ipecacuanha

—will be represented by samples grown in India. The economic plants introduced into India must necessarily form an important feature in its trade museum. Amongst trees *Eucalypti*, the baobab, cork oak, mahogany, have not as yet produced marketable results; but tea, cinchona, senna, nutmegs, pepper, cinnamon, cloves, barley, tapioca, the Maranta arrowroot, Orleans and Egyptian cotton, with their hybrids, Carolina rice, &c., are a few of the instances in which the successfully introduced plants have added, or promise to add, considerably to the exports of India. In the development of the natural resources of so vast a region undoubtedly much remains to be accomplished. Passing through this room, a great number of such unknown, undeveloped, or unappreciated objects will not fail to impress themselves upon the attentive observer. Surely with such vast forests, and a system of conservation so steadily pursued, more ornamental and furniture woods are destined to be exported than yet find their way to the coast; and there are at least sound timbers little inferior to teak, such as *Hopea odorata* is said to be, which require only to be more widely known to be more generally appreciated. In resinous products the European markets are as yet but little indebted to the forests of India, but the copals here shown from *Hopea odorata* and *Hopea micrantha* give considerable promise. The wood oils produced by several species of *Dipterocarpus*, and the Burmese lacquer derived from *Melanorrhœa usitatissima*, might be obtained in large quantities, and yet hitherto no practical application for them in this country has been discovered. The latter is employed to a very great extent in Burmah for lacquering furniture and small wares, but it is unsuited for the English process.

Amongst the objects in this room of interest to the botanist rather than to the general public may be cited the Tabashir, a siliceous secretion from the joints of the bamboo; the curious horn-shaped galls called Kakrasinghee, produced on a species of *Rhus*; manna obtained from *Tamarix indica* in the North-west Provinces, and a kind of manna named Shirkhist from the Punjâb, attributed to the *Fraxinus floribunda*; the resin somewhat resembling Elemi, derived from *Boswellia Frereana*, which the late Daniel Hanbury considered one of the ancient kinds of Elemi, but which is disputed on good grounds by Dr. Birdwood; narcotic Indian hemp in different forms, including the Churrus or hemp resin, and various confections into which it enters; the clearing nuts which are employed by natives in clearing water, and are the seeds of a species of *Strychnos*. To which may be added the paper-like bark of *Betula bhojpatra*, used in Northern India as a wrapper for cigars; the bark of one of the species of *Daphne*, from which the renowned Nepal paper is made, and the singular natural sacks made of the bark of *Antiaris saccidora*.

The models of native implements associated with the respective "products," drawings and photographs of the mode of using them, the copious illustrations of plants from whence useful substances are derived, and especially the series of photographs of forest trees, are calculated to increase the public interest in this collection, and add to its usefulness, although these features are not yet developed to the extent or in the systematic manner which they are intended to assume.

Rooms Nos. 4 and 5 contain the zoological collections, under the superintendence of the assistant curator, Mr. F. Moore. In it are comprised the various collections of Mammals, Birds, Insects, &c., contributed by officers of the old East India Company, whose names have been distinguished by their labours in this branch of natural history, of whom may be mentioned Buchanan, Cautley, Finlayson, Hodgson, Horsfield, M'Clelland, Raffles, Roxburgh, Russell, Wallich, &c.

Commencing with the Mammals, in Room No. 5, the various tribes have been so arranged in the several cases that the visitor at a glance may see the principal species in each group. From want of space, however, many of the larger species are at present precluded from being exhibited, and it is proposed to substitute photographs and other illustrations of them.

Following in order come the Birds, which have also been arranged in a similar manner, each group or tribe being represented by prominent and characteristic species.

In this room are also deposited the cabinets of Insects, several groups of which are provisionally exhibited in the window recesses, as well as an unique collection of Indian forest insect pests.

The tribes of Reptiles and Fish are shown in Room No. 4, and, though at present but few species are represented, this section will shortly be enriched by the extensive and valuable collections formed by the Inspector-General of Indian Fisheries.

Supplemental to these groups, which are arranged in a scientific series, these rooms contain an important collection of economic animal products, including an unique series of the silk-producing insects, lac, honey-yielders, and gall-making insects of India, and their several valuable products, as well as groups of pearl-oysters, chanks, wools, plumes, horns, ivory, &c.

For a series of fossils and plaster casts from the Cautley and Falconer collections, as well as the collections of shells and Crustacea, no cases have as yet been erected for their reception.

THE BIRDS OF GREECE *

THE third part of Mommsen's Griechische Jahreszeiten is devoted to an article upon the birds of the classical land, to our better knowledge of which Herr Mommsen's work is intended to contribute—an article which will be quite as interesting to naturalists as to the scholars for whom the periodical in question is primarily designed. The memoir is based upon the notes and observations made during his long residence in Greece and the adjoining parts of the Levant by Dr. Krüper, a naturalist well known to all students of European ornithology for his accurate and painstaking investigations of the birds of those countries, and especially for his discoveries of the breeding haunts of some of the rarer species. Dr. Krüper's notes have been further augmented in value by the co-operation of Dr. Hartlaub, of Bremen, one of the first of living ornithologists, who has contributed the references to the previous authorities upon each species, and a list of the existing memoirs relating to the same subject, besides adding many extracts from former writers to Dr. Krüper's observations.

The total number of species of birds noticed by Dr. Krüper in the present memoir is 358, on each of which notes of a more or less extended character are given. The arrangement adopted for the sake of convenience is that of Lindermayer's "Vögel Griechenlandes," published at Passau in 1860, and hitherto generally recognised as the best authority upon Grecian ornithology. Dr. Krüper's memoir must now, however, be referred to as more complete, and contains many recent additions to Lindermayer's list. We observe, however, that the work extends into limits which cannot (at any rate at present) be called Greece in its modern sense, as Dr. Krüper's recent discoveries in the neighbourhood of Smyrna of such birds as *Picus syriacus*, *Sitta krueperi*, and *Cossypha gutturalis* are introduced into it. It is, however, a matter of great convenience to ornithologists to have Dr. Krüper's notes upon the Birds of Greece and the Levant, many of which have been scattered through the pages of half a dozen periodicals, reduced into order under such excellent superintendence. Dr. Hartlaub's

* Griechische Jahreszeiten; unter Mitwerkung Sachkundiger, herausgegeben von August Mommsen. Heft iii. Schleswig, 1875.

numerous references render the volume of still greater value, and make it one that no naturalist who is interested in the Birds of Europe should omit to consult.

NOTES

ON July 5 the Sub-Wealden boring had reached the depth of 1,400 feet, and it is expected that this week it will have reached 1,500 feet. But this will have quite exhausted the funds of the Committee, and Mr. Henry Willett appeals for more subscriptions. "It cannot be too widely known," he states, "that unless 2,000 feet be reached, the solution of the problem is as far off as ever. We have met with nothing to show that Palæozoic rocks, as anticipated, may not lie at the estimated depth." We are inclined to think that Mr. Willett is too desponding in thinking that failure "seems to be imminent" from want of funds. We are sure there are many wealthy men, who, if the importance of the undertaking were properly represented to them, would come to the rescue and advance the trifling sum necessary for the completion of the experiment.

ON Saturday last, Sir George B. Airy, the Astronomer Royal, was entertained at the Mansion House on the occasion of the freedom of the City having been voted to him. A considerable number of well-known scientific and other gentlemen were present.

THE Royal Commission on Vivisection held their first regular meeting on Monday. The offices of the Commission are at 13, Delahay Street, Westminster.

IN connection with the recent volcanic eruptions in Iceland, which have caused great loss and much suffering to the inhabitants, the *Times* publishes the following abstract of a report by the Very Rev. Dean Sigurd Gunnarsson, dated Hallormsstad, in Múlasýsla, April 24, 1875 :—"On Easter Monday, early in the morning, loud rumbling noises were heard to the westward, and apparently travelled towards the north-east, in the direction of the mountain ranges bounding the valley of Fljótsdalshérad to the north. Presently the sounds turned backward along the southern mountains as well. The air was heavy and jet black towards the north and north-east. About nine o'clock whitish-grey scoriaceous sand began to fall from the sky, the particles averaging the size of a grain, but in shape longer. The dark column moved on nearer and nearer, and the darkness rapidly increased, while the scoriaceous hail thickened at the same rate. A full hour before noon candles had to be lighted in the houses, and at noon the darkness was as dense as that of a windowless house; even abroad the fingers of the hand could not be distinguished at the distance of a few inches from the eye. This pitch darkness lasted for about an hour. During the dark all glass windows appeared like mirrors to those inside, reflecting the objects on which the light fell as if they had been covered outside with a coat of quicksilver. For four consecutive hours it was necessary to have lighted candles in the houses. During all that time the ashes and the sand were falling thick and fast. Lightning and claps of thunder were at the same time seen and heard in rapid succession, and the earth and everything seemed to tremble again. The air was charged with electricity to such an extent that pinnacles, and staff-pikes of iron when turned into the air, and even one's hands when held up, seemed all ablaze. But the thunder differed from ordinary claps in this, that it travelled in rapidly-repeated echoes across the skies. When the darkness wore off the fall of the ashes abated. The dark column now moved inland towards the upper valleys; but, being there met by a counter current of air, it remained at first stationary for a while, and afterwards moved slowly down country again along the valleys, so that once more the daylight was changed into dusk, which was accompanied by the fall of fine ashes. After the fall the earth was covered with a layer of ashes and scoriæ from 1½ inches to 8 inches deep; coarsest where it lay thickest, in many cases exhibiting pumice boulders twice as large as the fist. In these places the ashes fell hot as embers on the ground. At first the fall of the ashes was accompanied by a foul sulphurous stink, which, however, very soon vanished. When the ashes had any perceptible taste it was that of salt and iron. For three days after the fall still weather prevailed, and the ashes lay undisturbed on the earth. Before the fall of the ashes the land was snowless and pasture plentiful; but after it not a creature could be let out of doors, and the sheep, if they were let out, would run as if mad in all directions. On the fourth day a pretty stiff south-west gale blew the ashes away from the hillocks and mounds, except the finest part, which remained on the sward, presenting the appearance of a compact scurf. But what little good this gale might have done was undone the next day by a wind blowing from north-west."

THE *New York Tribune* publishes additional information respecting the disastrous earthquake in South America. The locality where the earthquake occurred is the great coffee district of South America. The region affected by the shocks covers five degrees of latitude, and is 500 miles wide. The shock extended in a north-east direction along the northern range of the Andes. It was felt first very perceptibly at Bogota, the capital of New Granada, thence seemed to travel north, gathering intensity as it advanced, until it reached the south-east boundary line of Magdalena, where the work of destruction began, continuing as it advanced along the eastern boundary of Magdalena, following the line of the mountain range, and destroying in part or whole the cities of Cucuta, San Antonio, El Bosario, Salazar, San Cristobal, San Cayetano, and Santiago. The first premonition of the terrible visitation occurred on the night of May 17, when a strange rumbling sound was heard beneath the ground, although no earthquake occurred. It travelled in the direction afterwards taken by the earthquake, and lasted only a few minutes. On the morning of May 18 a terrible shock occurred. It suddenly shook down the walls of houses, tumbled down churches and the principal buildings, burying the citizens of the place in the ruins. Another shock completed the work of desolation. Three more shocks followed of equal intensity, but there appears to be no evidence that there were any openings in the earth, which on similar occasions have engulfed buildings and inhabitants, at least not in Cucuta. The shocks, with lesser force, however, seem to have been felt throughout the whole region of the earthquake for two days afterwards, extending to Cartagena and the western sea-coast. To add to the horror of the calamity, the Lobotera Volcano suddenly began to shoot out lava in immense quantities, or, as a correspondent writes, "it sent out a mass of molten lava in the form of incandescent balls of fire into the city."

DETAILS concerning Mr. Giles's exploration of the country lying about 100 miles from the coast-line of the great Australian Bight have come to hand (see vol. xii. p. 135). The country he examined seems almost useless for pastoral purposes, the greater part of it being dense scrub, "heavy red sand-hills with thick mallee, mulga, acacia, Grevilles, casuaxina, hakea, and spinifex." For 200 miles the greatest suffering was endured from the want of water, the horses all dying, and the party only being saved by the camels; Mr. Giles speaks of the latter as "wonderful, awe-inspiring, and marvellous creatures." He just touched the edge of Lake Torrens, and from what he has seen he judges that there exists a vast desert of scrub of a triangular form, the base of which is at or near the western shores of the lake, and the sides running north-westerly from the southern foot, and most probably west from the northern cone to an apex at no great distance from his starting-point, Youldeh. It consists of two

deserts divided by a strip of open country about thirty miles broad; the western one Mr. Giles has named Richards' Desert, and the eastern one Ross's Desert. His starting-point was Youldeb, 135 miles N.N.W. from Fowler's Bay. At Pyleburg, sixty-four miles from this, is an extraordinary native dam, and a clay tank, with circular wall five feet high around it, the work of the aborigines. Mr. Giles is confident of being able to cross to the settled district of Western Australia.

ADVICES from New Zealand represent the last shipment of salmon ova from Glasgow to that country as having arrived in a worthless state. The total length of time during which the eggs were packed on board ship was 121 days, or only nine days longer than the period during which it has already been proved by Mr. Buckland and Mr. Youl that the development of salmon may be safely retarded by ice. A large quantity of the ice remained till the end of the voyage, so that the temperature of the ice-houses must have been kept very low throughout the voyage. In fact it is said that the *exterior* of the packing never exceeded 43° Fahr. The officers of the Otago Acclimatisation Society state that microscopic examination proved that many of the eggs were unfertilised: but this was not the case with all; and it is hardly to be supposed that so experienced a pisciculturist as Mr. Buckland, who had charge of the operations of collecting and packing the eggs, could have improperly performed so important a duty. It is more than probable that of the large number of ova sent, many were handled by incompetent assistants. But this theory will not explain the want of vitality in the impregnated eggs, especially when the conditions for their safe transit were so favourable. The cases in which they were packed are described as "sodden," so that they did not suffer from dryness. It is probable, therefore, that want of ventilation was the cause of the failure of the experiment. It will be interesting to receive more detailed information from New Zealand, as our present advices hardly enable us to judge accurately of the state of the whole consignment.

AT the time of his death Dr. J. E. Gray had compiled a list of the books, memoirs, and miscellaneous papers of which, during his lengthy life, he had been the author. This Mr. J. Saunders has completed and seen through the press, a fitting last service to his illustrious chief. The total number is 1,162.

THERE is no professional branch of practice which is so much in need of elevation as the veterinary. On this account we feel particular pleasure in noticing the commencing number of a new monthly journal, the *Veterinary Journal*, conducted by Mr. George Flemming, of the Royal Engineers, whose valuable Manual of Veterinary Science and Police, as well as his other contributions to veterinary science, make it certain that the undertaking will not be found lacking in enterprise and the outspoken criticism of existing abuses. Messrs. Baillière, Tindall, and Cox are the publishers.

THE third part of the eleventh volume of the Transactions of the Zoological Society consists of a monograph by Prof. Owen on *Cnemiornis calcitrans*, the huge extinct Lamellirostral bird of New Zealand. We omitted to mention in connection with the preceding part of the same work that the monograph on the Birds of the Philippine Islands is by Lord Walden, President of the Zoological Society.

THE subscription for the families of the unfortunate aëronauts, Sivel and Crocé-Spinelli, has reached 3,200*l*. A monument will be erected by means of a special fund. The two aëronauts will be represented sleeping, wrapped in a large mantle, and the statue will be executed in marble, life size.

A VERY valuable publication is the "Seventh Annual Report on the Noxious, Beneficial, and other Insects of the State of Missouri," made to the State Board of Agriculture by Mr. Charles V. Riley, State Entomologist. It argues considerable enlightenment on the part of the Government of Missouri that they keep a State Entomologist, though Mr. Riley complains that his work is much hindered from want of sufficient funds. The necessity for such an official in Missouri is proved by the fact that a single insect, the Chinch Bug, filches nineteen million dollars from the pockets of the farmers in a single year, and reduces by so much the wealth of the State. "Yet, though the sum demonstrably amounts to millions," Mr. Riley states, "many of our legislators and some of our journalists would laugh at me were I to ask for an appropriation of five or ten thousand dollars to be expended in experiments which might result in giving us a perfect, or at least a much better remedy for the evil than any now in our possession, and thus save the whole or the larger part of this immense annual loss." In cases, as with the Locust, the Chinch Bug, the Cotton Worm, &c., where the evils are of a national character, Mr. Riley rightly advocates the appointment of a National Commission for the express purpose of their investigation, and consisting of competent entomologists, botanists, and chemists; and we are glad to learn that preliminary steps have been taken by some of the leading scientific men in the United States to memorialise Congress to create such a Commission, the members to be chosen by the Council of the National Academy of Science, and approved by the Secretary to the Treasury. The present Report is wholly occupied with the following noxious insects:—The Colorado Potato-Beetle, the Chinch Bug, the Flat-headed Apple-tree Borer, Canker-worms, the Grape Phylloxera, and the Rocky Mountain Locust.

THE U.S. Smithsonian Institution has lately undertaken an exploration which promises very important results in the interest of American archæology. It is well known that on some of the islands off the south coast of California there have been found some extremely interesting remains of prehistoric occupation on the part of the aboriginal tribes of the country, these consisting of stone implements in great variety, soap-stone bowls, bone and shell ornaments, &c., forming a valuable collection already obtained for the National Museum. With a view of exhausting the locality and securing whatever may still remain of interest, the services of Mr. Paul Schumacher, who had previously explored the region, have been secured by the Smithsonian Institution, and he left San Francisco early in May, with four labourers, for the scene of action. The U.S. Treasury Department gave him transportation on the revenue steamer *Rush*, and the War Department supplied tents and camp equipage. It is expected that this investigation will occupy several months, and that the results will be almost as interesting in their relations to American archæology as those of Di Cesnola in Cyprus, and of Schliemann in Troy, to that of the Old World. The special object of this investigation is the furnishing of material for the grand display to be made at the Centennial by the combined efforts of the Smithsonian Institution and the Indian Bureau.

THE Eighth Annual Report of the Trustees of Cambridge, U.S., Peabody Museum of American Archæology and Ethnology contains a memoir of Jeffries Wyman, the late Curator, to whom Mr. F. W. Putnam has succeeded. The Report contains besides some account of the additions made to the Museum since last Report, which are extensive and valuable. One of the principal additions is a collection of earthen dishes and vases, a number of bone and stone implements and miscellaneous articles from mounds near New Madrid, Missouri, and several stone implements from various localities in that State, collected by Prof. G. C. Swallow. This is a very important collection, particularly rich in articles of pottery and stone of the mound-builders. The Report contains a pretty full account of these with many illustrations, especially of articles of pottery of very varied and remarkable shapes. The mounds from which

they were taken appear very ancient; soil has formed on them to the depth of three feet, and the largest trees grow on them and the connected embankments or levees. Another large collection, by Mr. F. W. Putnam, comes from fortifications, caves, and mounds in Indiana and Kentucky, and consist of implements, weapons, pottery, sandals, bark-cloth, crania, &c.

MR. F. CLOWES, B.Sc., has been appointed Natural Science Master in the recently-established Middle Class Public School at Newcastle-under-Lyne. Mr. Clowes is the author of a work on Practical Analysis, and is well known as a sound and accurate chemist.

PROF. C. F HARTT, of Cornell, U.S., has been appointed, with Major Continho, a Brazilian, to take charge of the Geological Survey of Brazil.

IT is estimated that 10,000,000 acres of land in Algeria are covered with a spontaneous growth of the Alpha plant. The exportation of this fibre for paper-making has increased very rapidly during the past five or six years. In 1869 it amounted to 4,000 tons, in 1870 it rose to 32,000 tons, and in 1873 to 45,000 tons, while the past year's produce was expected to reach 60,000 tons. The average price at Oran is about 140 francs per ton.

A VERY fine specimen of the singular rubiaceous epiphyte *Hydnophytum formicarium* has recently been received at the Kew Museum. This specimen measures some thirteen inches through, and was accompanied by some of the ants which make their nests in the fleshy tubers of the plant. These ants were very lively when received, and prove to be the *Camponotus irritans* of Smith.

PROF. BRADLEY, of Knoxville, Tennessee, has recently published the results of his geological labours among the Southern Appalachians, and they throw much light upon the probable age of the crystalline rocks of that region. It has long been the tendency of geologists to regard the metamorphic crystalline rocks of the Atlantic coast as certainly pre-Silurian. This has, however, been called in question by the observations of Prof. Dana, which go to prove that the limestones and accompanying schists and quartzites of Western New England are *all* Silurian, and not Huronian or Laurentian. Prof. Bradley now claims the same for the region he has investigated, that is, the western portion of North Carolina, the eastern part of Tennessee, and much of Georgia and Alabama. The evidence upon which the conclusion is based is stratigraphical, and must be studied in detail to be fully understood. The time at which the uplift and metamorphism of this region took place is considered by Prof. Bradley to have been post-carboniferous, and it is probably referable to the close of the palæozoic.

A VERY interesting and important addition to the ethnological branch of the National Museum at Washington, U.S., has lately been made in the form of a large collection of objects of stone from Porto Rico. This was gathered from the ancient graves of the island during a period of many years by Mr. George Latimer, an American citizen residing in that place. The most noticeable features in the series consist of about fifty oval stone rings of much the size and shape of horse-collars, all variously carved and ornamented. There are also many statuettes, carved heads, triangular stones with faces of animals carved at either end, some pottery, and numerous axes and chisels—some of exquisite beauty, and polished to the highest degree. Many of them are of the green jade so much sought after by archæologists.

MR. ELLIOT STOCK sends us an essay by Mr. T. K. Callard, F.G.S., on "The Geological Evidences of the Antiquity of Man reconsidered;" being an attempt to show that man's antiquity is not so great as some eminent geologists make it to be, and that "man's advent was accompanied by the introduction of a vast number of fresh forms both in the vegetable and animal life, and that this took place soon after a great devastation of the former flora and fauna, which devastation was accompanied by ice and water."

THE *Electric News and Telegraphic Reporter* is the title of a new journal, edited by Mr. W. Crookes, F.R.S., to be published every Thursday. We wish it success.

THE sturgeon fisheries of Schleswig Holstein yielded 1,917 fish during 1874, of which 1,355 were caught in the Elbe, and 562 in the Eider. In 1873 the total was 2,174.

M. A. LANCASTER, of the Brussels Observatory, sends us a paper, reprinted from the *Bulletin* of the Belgian Academy, on the remarkable dryness of the months of February, March, and April of this year.

MR. ELLERY'S "Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism," &c., at Melbourne Observatory, for September and October 1874, are to hand.

THE latest additions to the Manchester Aquarium include twelve Octopus (*Octopus vulgaris*) from the Channel Islands; seven King, or Horse-Shoe Crabs (*Limulus polyphemus*) from North America; twelve Large Spider Crabs (*Maia squinado*) from Devonshire; two Lettered Terrapins (*Emys scripta*) from New Orleans; two Salt-water Terrapins (*Malachlemys concentrica*) from Mexico; one Horned Toad or Crowned Tapaxaxin (*Phrynosoma cornutum*) from Mexico; one Alligator (*Alligator mississipiensis*) three feet long.

THE additions to the Zoological Society's Gardens during the past week include two Macaque Monkeys (*Macacus cynomolgus*) from India, presented by Lord Lindsay; a Sloth Bear (*Melursus labiatus*) from India, presented by Mr. Richard A. Roberts; three American Red Foxes (*Canis fulvus*) from N. America, presented by Mr. Edward Darke; a Peregrine Falcon (*Falco peregrinus*), European, presented by Mr. H. J. Watson; a Water Viper (*Cenchris piscivorus*) from N. America, presented by Mr. J. F. Painter; a Gambian Goshawk (*Astur tibialis*) from W. Africa, purchased; three Indian Adjutants (*Leptoptilus argala*), two Pondicherry Vultures (*Vultur calvus*), seven Indian Cobras (*Naia tripudians*) from India, deposited; six Trumpeter Swans (*Cygnus buccinator*), a Common Fallow Deer (*Dama vulgaris*) born in the Gardens.

OUR BOTANICAL COLUMN

THE POTATO DISEASE.—It will be remembered by those of our readers interested in the potato disease, that Lord Cathcart offered a prize in 1873 for the best essay on the "Potato Disease and its Prevention;" and it will also be fresh in their memories that of the ninety-four essays sent in, not one was considered by the judges to deserve the prize. This circumstance, and Prof. Dyer's summary of the history of what was known of the disease, delivered before the Horticultural Society last year, gave rise to some correspondence in this and other journals. Few subjects, probably, have been so fertile a source of wild theories and speculations. Mr. Eccles Haigh, one of the competitors for Lord Cathcart's prize, now comes before the public on his own responsibility, with a theory which at least has the merit of ingenuity, and is based upon a cleverly worked out idea. But it seems to us that the writer has taken up a wholly untenable position. In a pamphlet of forty-four pages, small octavo, the writer traces the causes not only of the murrain, in which *Peronospora infestans* is so destructive, but also of the "curl," a disease very prevalent just before the appearance of the present scourge; and, to his own satisfaction, explains how these diseases are to be prevented. To be brief, gardeners are credited with having induced by their mode of cultivation the "curl," and afterwards, in getting rid of that, brought on the present far more formidable scourge. Mr. Haigh endeavours to show that during the "curl"

period the potato bore enormous crops of berries, whilst since the prevalence of the murrain it has almost ceased flowering and fruiting; and in these facts (?) lies the whole gist of the matter. The production of fruit in profusion is regarded as an exhausting process so far as the tubers are concerned, and this is so far a very philosophic assumption, inasmuch as fruit-bearing is one of two ways to ensure the propagation of the plant. But here it becomes necessary to give the author's view respecting the "Functions of Nitrogenous Matter." It is in substance that the formation of fruit draws the nitrogenous matter from the plant and tubers, and when excessive crops of fruit are borne, the tubers are left without sufficient of this vital principle to continue the existence of the plant. On the other hand, when little or no fruit is produced, the tubers are left overcharged with this nitrogenous matter, which here becomes a source of decomposition, in proof whereof we are gravely told that the decay of manure is due to the presence of nitrogenous matter. It has long been admitted that excessive luxuriance predisposes in favour of disease; but this assumed presence of nitrogenous matter in the wrong place will hardly be accepted as an adequate explanation of the phenomena presented by the curl and the murrain. It is assumed that the potato left off bearing berries just about the time of the appearance of the murrain, and this we are told was brought about by the use of artificial manures containing a large percentage of nitrogenous matter. The "curl" was cured or rather prevented by using sets (tubers) from plants which had not been allowed to ripen seed. We have not space to examine the writer's arguments in support of this theory, but we may give his remedy.

"Having so fully set forth the natural habit of the plant, and so copiously elucidated the principles on which my theory of the disease is founded, the means of its prevention all but suggest themselves. They require compliance with but two simple forms: regenerate through the seed two or three times, and abstain as nearly as practicable, not only from nitrogenous artificial manures, such as guano, sulphate of ammonia, rape-cake, nitrate of soda, but also from strong farmyard manure."

We do not intend to attempt to refute the author in detail here, as it would occupy too much space; but we may observe that the condition of practical experience imposed upon the competitors for the Cathcart prize, of which our author complains because it disqualified him, was the wisest provision in the whole business. It is just this want of practical experience and personal knowledge that has led him astray in regard to the berry-producing power of varieties now cultivated, of the description of manure usually employed, &c. Why all varieties of the potato in all parts of the kingdom should have become just so much overcharged with nitrogenous matter at exactly the same time as to take the disease is rather puzzling. Does the writer not know that the Vine Mildew, *Oidium Tuckeri*, has been successfully combated?

Since the preceding lines were written, the report of a new (?) disease having attacked the potato-crop has caused some consternation and alarm. First we hear that it has destroyed the entire crop of American varieties in the trial gardens of the Horticultural Society at Chiswick; then the appearance of the same disease is observed in Northumberland, but here again only American varieties are affected, and a vain hope is indulged in that it may soon be stamped out. The following week, however, the horticultural journals begin to teem with letters from the most distant parts, and the unwelcome truth that all varieties are alike attacked, or liable to be attacked, is forced upon us. True, we read of certain varieties being diseased, whilst others remain healthy in the same garden, but we fear there is no ground for believing that it is restricted to any particular varieties, whether of English or American origin. The Rev. M. J. Berkeley is investigating the nature of the disease, which he regards with considerable anxiety. It appears to be caused by, or perhaps succeeded by, a fungus growth. At all events a fungus is present; but we must await a thorough microscopical examination for more precise information. Mr. Shirley Hibberd, in a letter to the editor of the *Times*, takes a more hopeful view of the matter than we can; and his description of the nature and spread of the disease is not borne out by the reports from other quarters. His statement that the new disease begins in the "set" and progresses upwards, is in direct contradiction to the experience of others. In the *Gardener's Chronicle* it is affirmed that the sets of affected plants were cut in two, and in no case was there the slightest evidence of disease in the tuber causing immature and diseased haulm. Possibly, however, it may manifest itself in different forms.

SCIENTIFIC SERIALS

THE *Journal of the Chemical Society*, April and May.—The April number contains the following papers:—Researches on the paraffins existing in Pennsylvanian petroleum, by Thos. M. Morgan. This paper is followed by some remarks on the same subject by Prof. C. Schorlemmer.—On Groves' method of preparing chlorides, by the same.—A note on aricine, by David Howard.—On the precipitation of metals by zinc, by J. L. Davies. The author failed to precipitate to any large extent many of the metals which, according to some metallurgical books, are precipitated by zinc from acid solutions. Copper and the other well-known metals reduced by zinc precipitate well enough, but nickel, cobalt, iron, &c., do not. If, however, ammonia was added to their solutions the precipitating power of the zinc was rendered as efficient as under ordinary circumstances it is with copper, &c. The zinc was used in the shape of filings, and the author remarks that the metals precipitated by it under the above circumstances present a beautiful metallic appearance, and are in a weighable form.—On the action of the organic acids and their anhydrides on the natural alkaloids (Part III.), by G. H. Beckett and C. R. Alder Wright. The authors in this paper treat first of the action of acetic anhydride on the polymerides of codeine and morphine (dicodeine, tetracodeine, and tetramorphine being considered, further also the action of ethyl iodide on tetracodeine and octacetyl-tetracodeine); they then speak of isomeric diacetyl morphines, and of the action of ethyl iodide on acetylated morphine, codeine derivatives, and analogous products. The compounds treated of in the latter division are diacetyl-codeine ethiodide, tetracetyl-morphine ethiodide, α-, β-, and γ-diacetyl-morphine ethiodide, dibutyryl-codeine ethiodide, tetrabutyryl-morphine ethiodide, dibutyryl-morphine ethiodide, dibenzoyl-codeine ethiodide, tetrabenzoyl-morphine ethiodide, and α diacetyl-dibenzoyl-morphine ethiodide. Finally, there is an account of the action of ethylate of sodium on acetylated codeine and morphine.—The *Journal*, as usual, contains numerous abstracts from other serials.—The May number contains the following papers:—Further researches on bilirubin and its compounds, by Dr. J. L. W. Thudichum. This is a most elaborate paper, and we must refrain from entering on its details, confining ourselves to a mere outline of its contents. First, the author gives an account of the behaviour of bilirubin with the halogens, and in turn speaks of mono- and dibromo-bilirubin, the tri- and tetrachloro-bilirubin (with iodine there is no reaction at 80° to 100°). Then Dr. Thudichum proceeds to consider the operations made by chemists on bilirubin, prior to his own. He then describes some experiments bearing upon the alleged transformation of bilirubin into the colouring matter of urine, and treats of Maly's hydrobilirubin, urochrome spectra, and the spectra of the chemolytic products of bilirubin. We then have an account of experiments made with Jaffé's product, with which Maly compared his biliary product more particularly. Jaffé's product was obtained from febrile persons, and Dr. Thudichum points out that a source of error must here be eliminated, namely, the abnormal product urerythrin. He gives the spectrum and a new reaction of this compound; finally, there is a note on Jaffé's urobilin. The paper ends with a summary of conclusions *against* the alleged metamorphosis, and with some remarks on the author's theory of bilirubin and bilirubates, and on Städeler's hypothesis regarding the same.—On calcic hypochlorite from bleaching powder, by Charles T. Kingzett. This treatise turns on the chemical constitution of bleaching powder, on which subject the opinions of eminent chemists are at variance. The author describes four experiments which he made with a view to bring light into the matter, but he was not completely successful. Although his experiments may be regarded as a perfect proof of the body being in mass hypochlorite of calcium, yet he is nevertheless reluctant in being too positive on the subject, and recommends further investigation.—On a simple method of assaying iron, by Walter Noel Hartley. The principles on which this method depends are (1) The abolition of weights by exactly balancing a quantity of the ore to be examined against pure iron wire. (2) The reduction of inaccuracies in weighing by making the solutions of the iron and the ore up to the same volume, and taking a fraction (about $\frac{1}{10}$) of the liquid for experiment, whereby the error of the balance is diminished $\frac{1}{10}$. (3) The reduction of all other experimental errors to a minimum by putting comparable quantities of both ore and pure iron under precisely the same conditions. There is the usual number of abstracts in this part.

THE *Geographical Magazine*, July.—This is a particularly interesting number of this magazine. The first article is an abstract of the narrative of Captain the Hon. G. C. Napier, who has recently returned to India after an adventurous tour in Northern Persia. An article on "Recent Russian Explorations in Western Mongolia," accompanied by a map, gives some account of (1) Sosnovski's and Miroshnichenko's explorations on the Upper Irtysh in 1872–73; (2) Matusovski's journey into the Ektag-Altai in 1873; (3) A Russian caravan journey to Kobdo, Uliassutai, and Baikul in 1872. In an article on Paraguay the leading features of the history of that country are traced. In "A Trip up the Congo or Zaire" river, Selim Agha gives an interesting account of his journey from Fernando Po to that river in company with Capt. Burton; the latter prefaces the narrative with a few words of personal notice of his old factotum and companion. To those whose interest in Zanzibar has been awakened by the present visit of its sovereign to this country, the account of the dominions of the Seyyid Burghash, along with the good map which accompanies it, will be welcomed. The usual reviews and reports fill up the number.

Journal of Proceedings of the Winchester and Hampshire Scientific and Literary Society, vol. i. part iv., 1874.—We are glad to see from the president's address that this Society is doing much real work, and especially that it is devoting itself with considerable zest and good results to field-work. The Society includes in its programme a wide variety of subjects, and its Journal contains good papers in various departments of science. The president, the Rev. C. Collier, after reviewing the Society's work for the year, gives an interesting address on the archæology of Winchester and its neighbourhood. Other papers in the part are "Selections from the Sanskrit Poets," by Mr. W. Waterfield; "Sarsens, greywethers, or Druid Stones," by Mr. Joseph Stevens; "Two-winged Plagues," a paper on Œstrids, Tabanids, and Hippoboscids, by the Rev. W. W. Spicer; "The Chalk Formation," by Mr. C. Griffith; and "A Gossip about Mites," by the Rev. W. W. Spicer.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, May 1.—This number contains an account of Mr. Colding's work on the behaviour and relations of atmospheric currents, consisting mainly of mathematical reasoning based upon a study of the movements of water, which he considers analogous to those of air. With regard to hurricanes, he observes that just as in a water eddy the velocity of rotation increases from the circumference towards the centre, until at the inner surface it becomes imaginary, so the velocity of the wind increases from the circumference of a revolving storm towards the centre, but at a certain distance from the centre, the boundary of the calm space, falls suddenly to stillness. He believes the following formula, which applies to water, to be good for air also, both being bounded by a resisting medium. Let water circulate in a cylinder, where H = depth of current at the circumference, V = velocity of current at the surface; then at a depth x below the surface:

$$v = V\left(1 - 0{\cdot}433\left(\frac{x}{H}\right)^{\frac{3}{2}}\right)$$

when the resistance at the base is equal to that which would be exercised by a substratum of water. If water flows in at one point in a vessel containing water, and flows out at another point, and the inflowing and outflowing quantities are equal, the surface remains at a constant level. Let the supply be in the middle and the outflow round the circumference, the water will descend towards the circumference. If the contained water be rotatory, its condition will be similar when a constant stream flows in; there will be an increase of pressure at all points, and the water will attain a higher level, descending in the directions of its escape. A whirlwind can withstand pressure from without only when the rotation has a certain velocity, and although a considerable quantity of air must flow to the whirlwind along the surface of the earth, on the other hand a permanent current must flow outwards in the direction of the surface level. In moving over the surface of the earth it encounters many obstacles, which reduce the velocity of rotation, so that an inrush of the air at higher pressure takes place, and immediately the condensed air in the lower strata forces outwards a quantity of air at the top proportionate to that which streams towards the centre below. This action of course diminishes the fury and increases the diameter of a hurricane, and exhibits the twisting motion so often observed in small whirlwinds and waterspouts. The rest of the article will be given in the next number of the *Zeitschrift*.

Der Naturforscher, May 1875.—From this part we notice the following papers:—On the atomicity of nitrogen, by Victor Meyer and M. Lecco. These gentlemen arrive at the conclusion that nitrogen is not a triad, as thought by some chemists, but a pentad.—On the process of fertilisation with fungi (Basidiomycetes) by Van Tieghem.—On the evaporation of moisture through the human skin, by Fried. Erismann.—On the cause of luminosity or non-luminosity of carboniferous flames, by F. Wibel.—On the artificial imitation of native polar-magnetic platinum, by Daubrée.—On the tenor of nitrogen in soil-acid, by E. Simon.—On the behaviour of some solutions in polarised light, by O. Hesse.—On the marine flora existing at Spitzbergen during winter, by Herr Kjellman.—On the temperatures in the southern and northern Atlantic Ocean, by Herr von Schleinitz.—On melting points, by Herr Müller.—On the dependence of the action of emulsine upon physical conditions, by Herren E. Marckurst and G. Hüfner.—On hardened glass, by Herr Bauer.—On the so-called "Riesenkessel" (gigantic kettles) near Christiania and their origin, by Herren Brögger and Reusch.—On the immunity of *Gymnotus electricus* against its own electric shock, by Herr J. Steiner.—On the influence of light on the weight of animals, by Dr. Fubini.—On the dependence of the specific heat of carbon, boron, and silicon upon temperature, by Friedrich Weber.—On the action of the central organs of the nerves, by Herr Frensberg.—On the spectrum of Encke's comet, by Herr von Konkoly.—On the action of the electric current on fused amalgama and alloys, by Eugen Obach.

Monthly Notices of Papers and Proceedings of the Royal Society of Tasmania for 1873.—This has only just come to hand, and the subject matter of some of the papers has lost in interest, inasmuch as some of the phenomena discussed—the Transit of Venus, for instance—have since taken place. Mr. F. Abbot's paper on the Transit of Venus, with special reference to the importance of determining the true distance of the sun in connection with meteorology, is a most interesting contribution. Speaking of the effects of conjunctions, he alludes to the fearful storm which took place Nov. 27, 1703, when five of the planets were in conjunction. The storm swept over the continent of Europe, causing an immense amount of damage. It was on that day the whole structure of the first Eddystone Lighthouse, together with its architect, Winstanley, and other inmates, was blown into the ocean.—The principal other contributions are on the Mersey coal-measures, by T. Stephens, M.A.; on the Tertiary Beds in and around Launceston, by R. M. Johnston; Contributions to the Phytography of Tasmania, by Baron F. Mueller; and Law of Weather and Storms, by the Right Rev. Bishop Bromby.

Reale Istituto Lombardo.—Rendiconti: vol. viii., fasc. x. and xi.—These parts contain the following papers:—On scientific association, by Prof. G. Sangali.—On the "Jaborandus," by Prof. S. Garovaglio.—On the importance of the study of meteorology to agriculturists, by Prof. Gaetano Cantoni.—On the reasons why sulphur destroys the *Oidio* (a cryptogamic parasite) of the vine, and on the emission of free hydrogen from plants, by Prof. E. Pollacci.—On two questions relating to chimneys, by Prof. R. Ferrini.—On hydrostatic pressure in relation to the molecular motion of gravitation, by Dr. G. Grassi.—The remaining papers in this part relate to political and moral sciences.

THE *Journal de Physique Théorique et Appliquée*, May 1875, contains the following original papers:—Researches on the modifications which light undergoes in consequence of the motion of the luminous source and of that of the observer, by M. Mascart.—On the currents of mechanical origin, by E. Bouty.—On the combustion of explosive mixtures, by M. Neyreneuf.—On the apparatus used for the explanation of the laws and formula of elementary optics, by C. M. Gariel.—On the determination of the electric capacity of bodies and of their condensing power by means of Thomson's electrometer, by M. A. Turquen.—A note by M. C. Daguenet, on the electric light in rarefied gases.

Verhandlungen des Vereins für Naturwissenschaftliche Unterhaltung zu Hamburg, 1871–74.—This is the Vereins' first publication, and contains an account of the formation and of the first year's doings of the Society, together with a copy of the laws and regulations, and a list of members. Further on we have several well-written articles, viz.:—On the preparation of caterpillars for collections, by G. J. Wittmack.—On some attempts at silk-culture with *Bombyx mori*, by Georg Semper.—Researches

on the effects of trichinæ on white rats, by C. Rodig.—On a method of preparing slugs for dry keeping in collections, by F. Hübner.—Geological recollections of a few weeks at Weymouth, by Dr. Filby.—Some remarks on *Cypraea*, by Dr. Aug. Sutor. On the homoptera of Schleswig, by Dr. H. Benthin.—Finally, there are a number of papers relating to the fauna of the Lower Elbe, some of which are highly interesting.

THE March number of the *Bulletin de la Société d'Acclimatation de Paris* contains, among other papers, one by M. E. Rénard, on a new kind of bamboo, and the articles made from the canes of this species of plant. This particular variety is square, and is found in the Chinese provinces of Honan and Se-tchuen.—M. le Comte Pouget, in a note on the Kagou, describes a new bird known by that name in New Caledonia, of which it is a native, and called *Rhynochetos jubatus* by ornithologists. The bird is entirely insectivorous, feeding on almost every kind of insects and worms, and appears to thrive in the climate of France.—M. Gildas, a priest in the monastery of Nôtre Dame de la Trappe des Trois Fontaines, near Rome, gives a description of the growth of Eucalyptus trees in the Roman Campagna; the salubrity of the locality has, partly in consequence of sanitary works, and partly probably in consequence of the effect of these trees, been greatly increased of late years.—The Colorado potato beetle (*Doryphora decemlineata*) is being made the object of special research by members of the Society. M. Maurice Girard states that as this insect does not exist always in close contact with the plant on which it lives, it will probably suffer from the change of climate to which it is subjected by transportation from America to Europe, and will consequently die off. Had it been, like the Phylloxera, an insect living always closely fixed to the tree on which it preys, there would have been greater danger of its permanent introduction into other countries.

SOCIETIES AND ACADEMIES

LONDON

Anthropological Institute, June 22.—Col. A. Lane-Fox, president, in the chair.—A paper by Mr. Herbert Spencer was read on the comparative psychology of man. The author commenced by showing the necessity for division of labour in a systematic study of psychology, and proceeded to map out the subject into divisions and subdivisions, and to indicate the manner in which its various branches might be investigated. The main divisions were—mental mass and complexity, the rate of development, plasticity, variability, impulsiveness, difference of sex, the sexual sentiment, imitation, quality of thought, peculiar aptitudes, with their many subdivisions. Mental effects of mixture, and the inquiry how far the conquest of race by race has been instrumental in advancing civilisation, would also come within the scope of comparative psychology.—Mr. John Forrest read an account of the natives of Central and Western Australia, whom he had observed during two journeys he had made across the country from Western to South Australia. Among their customs might be mentioned that of tattooing on the shoulders, back, and breast, and the practice of boring noses, which is raised to the importance of a ceremony, when hundreds of individuals gather together for that object. Circumcision he found to be universal. The use of the boomerang was described, and the exaggerated statements concerning the manipulation of the weapon were corrected. Cannibalism was common among the natives of the interior. Many other descriptive details of their faith, manners, and customs were given.—A paper by Capt. John A. Lawson was read on the Papuans of New Guinea. The only part of the coast that the author examined was Houltree, and there, as in the interior, he met with a race of people dissimilar to those described by other travellers who have visited various parts of the coast. There was a marked diversity in stature; in the south of the island the people were shorter than those inhabiting the north. They were possessed of enormous muscular power, and showed a large thoracic development. Their complexion was a dark tawny, but not black, and their features were of Negroid type.

Royal Horticultural Society, June 2.—Scientific Committee.—J. D. Hooker, M.D., C.B., F.R.S., in the chair.—Prof. Thiselton Dyer made some further remarks on *Tetranychus Taxi*, A. Murr., which he thought did not attack the ordinary buds of the Yew, but, as far as he had observed, those containing the female flowers. The acarus appeared to feed on the nucleus of the ovule and the adjoining scales, the external scales became brown and withered.—The Rev. M. J. Berkeley showed specimens of *Hypoxylon octraceum*, which was figured by Bulliard, tab. 444, fig. 3. It had been referred by Fries to *Lophium mytilinum*, but was really, as Sowerby was aware, the cocoon of a midge. Mr. Berkeley had met with similar cocoons belonging to other species, and Prof. Westwood was understood to be preparing descriptions of all three.—Prof. Thiselton Dyer exhibited specimens of the capsules of *Hibiscus Rosa-sinensis*, which, though the plant was so common in gardens, were quite undescribed. According to Dr. Cleghorn, it rarely if ever fruited in India. In Barbados, on the other hand, it fruited abundantly in the garden of General Munro.—Mr. Andrew Murray read a paper on the packing of living plants for transport.—Prof. Thiselton Dyer called attention to Willkomm's "Die mikroscopischen Feinde des Waldes," in which the Larch-canker was shown to be due to the attacks of the so-called "*Corticium amorphum*," since described by Hartig as *Peziza Willkommii*.

General Meeting.—W. Burnley Hume in the chair.—The Rev. M. T. Berkeley called attention to the more interesting objects exhibited. The young shoots of apple-trees were liable to great injury from an *Oidium*, which might, however, be destroyed by the use of sulphur; specimens were exhibited.

June 16.—Scientific Committee.—A. Murray, F.L.S., in the chair.—A letter was read from the Hon. Secretary of the Wiltshire Horticultural Society relating to some diseased potatoes, upon which Mr. Berkeley remarked that he had recently found the American varieties at Chiswick, especially the Early Rose, dreadfully affected with disease, communicated from the tuber to the haulm. Mr. Berkeley had hitherto been only able to make a superficial examination, but he suggested that possibly the disease in question was analogous to the "curl," a disease well known many years ago, but since then not noticed. He had found in the cells of the leaf an obscure fungoid organism—a species of *Protomyces*.—Mr. Bateman exhibited a package of the Paraguay tea, *Ilex paraguayensis*, together with the gourd and strainer used by the natives in the preparation of this tea, as figured in Hooker's *Journal of Botany* many years since.—Mr. W. G. Smith exhibited a drawing of the mould (*Ascomyces deformans*) which is associated with the Peach blister.—Dr. Masters exhibited on the part of the Rev. H. N. Ellacombe a portion of the main root of an apple nearly gnawn through by the Water Vole. Dr. Masters also showed *Cheiranthus Cheiri* var. *gynantherus*, to show that the peculiarity was reproduced from seed.—Dr. Hooker sent for exhibition the nest of a trap-door spider found in the bark of a tree at Uitenhage, Port Elizabeth, South Africa, where it was obtained by Mr. Bidwell, a member of the Legislative Assembly of Cape Town. The nest and the lid were so nearly like the bark itself that it was with difficulty the lid could be seen, and it was with some difficulty that the lid could be raised, as the insect was still within the nest. Mr. Murray suggested that the spider had taken possession of the empty cocoon of a moth (*Bombyx*), and had woven a lid to it with silk and fragments of bark.

General Meeting.—Hon. and Rev. J. T. Boscawen in the chair.—The Rev. M. J. Berkeley gave an account of the new potato disease, which he identified (as mentioned above) with that formerly known as the "curl."

PHILADELPHIA

Academy of Natural Sciences, Sept. 22, 1874.—Dr. Ruschenberger, president, in the chair.—Prof. Leidy remarked that he had found several specimens of the curious rhizopod, discovered by Cienkowski, and named by him *Clathrulina elegans*. They were found among Utricularia, but though retaining their stems, were unattached and apparently dead. One of the specimens presented a peculiar and as yet unexplained character. On one side of the latticed head the orifices were capped with little inverted hemispherical cups, from the top of which projected a funnel like the cup of the spongozoa. Prof. Leidy was pursuing his search for the living and attached Clathrulina.—Prof. Leeds made some remarks concerning a remarkable mineral found in a bank of white sand near Fayetteville, N.C. It was, in appearance, a tube of glass four feet in length and two inches in diameter, which was made up of a great number of irregular fragments. These fragments were highly polished on one side, the side apparently turned towards the hollow axis of the rod, and excessively contorted on the exterior side. They consisted almost entirely of silex, the remainder being chiefly oxide of iron. Accurate analysis showed that the percentages of the constituents in these siliceous

fragments and in the sand found in the hollow core of the rod were the same. On account of this identity in composition, and the incompetency of any other known agent to produce such a fusion of almost pure silex, it was concluded that this "rod of glass" was a result of lightning—a lightning-tube, or fulgurite, as such products have been called.—Mr. Thomas Meehan referred to a former communication in which he exhibited specimens of *Euphorbia cordata*, or *E. humistrata*, collected by him in the Rocky Mountains, and which, normally procumbent, had assumed an erect habit on being attacked by a fungulus, *Æcidium euphorbiæ hypericifoliæ*. He now found that the common trailing Euphorbia of our section, *E. maculata*, when attacked by the same fungulus, assumed the same erect habit. With change of habit of growth there was a whole change in specific character in the direction of *E. hypericifolia*.

Sept. 29.—Dr. Ruschenberger, president, in the chair.—On favourable report of the committee to which it was referred, the following paper was ordered to be printed:—"Notes on the Santa Fé Marls, and some of the contained Vertebrate Fossils," by E. D. Cope.

Oct.—Mr. Thomas Meehan introduced a specimen in which plants of *Triticum* and *Bromus* were blended. This Dr. J. G. Hunt proved to have been a "cheat;" neither did he think the workman had been expert in his manipulation.—Mr. Redfield drew attention to the growth, near Delaware River, of *Polygonum orientale* and *Cleome pungens*, which Prof. Leidy traced to ballast deposited there. The lastnamed author then drew attention to some new species of *Difflugia*.—Mr. Meehan announced the discovery of *Abies concolor* in Glen Eyrie, Colorado, by Dr. Engelmann; and Prof. Leidy drew attention to the devastation of the oaks of New Jersey, by the *Dryocampa senatoria*.

Nov.—Mr. A. R. Grote presented a paper on a new species of *Nocteridæ*, describing as new genera and species *Acronycta exilis*, *A. paupercula*, *Eutolype*, *Himella*, &c.; and Prof. Cope described some ruins of villages of extinct races near Nacimiento, N.M.—Prof. Leidy, besides referring to *Titanotherium*, drew attention to several Protozoa which he was studying, including species of *Clathrulina elegans*, *Amœba viridis*, &c.—Prof. P. Frazer, jun., described the geology of certain lands in Ritchie and Tyler Counties, W.V.; and Dr. Elliott Coues read a synopsis of the *Muridæ* of North America, dividing the Murinæ into the genera *Mus*, *Neotoma*, *Sigmodon*, *Hesperomys* (Waterhouse, emend.), *Ochetodon* (n.g.); and the Arvicolinæ into *Evolomys* (n.g.), *Arvicola*, *Synaptomys*, *Myodes*, *Cuniculus*, and *Fiber*.

VIENNA

K. K. geologische Reichsanstalt, Jan. 5.—This was a festival meeting in celebration of the 25th anniversary of the foundation of this institution. No scientific papers were read. From those read at the subsequent meetings, Jan. 19, Feb. 16, March 2 and 16, we note the following:—Geological report from travellers in Persia, by Dr. E. Tietze.—On the Aralo-Caspian basin, by Dr. M. Neumayr.—On some pseudomorphous copper ores from the Ural, by E. Döll.—On well-sinking in the Vienna district, by T. Fuchs.—On Tertiary stone forma ions in Carniola, by the same.—On the formation of terra rossa, by Dr. Neumayr.—On a new occurrence of manganic peroxide in Lower Styria, by Dr. R. v. Drasche.—On the gneiss formation of the Bohemian forest, by Dr. J. Woldrich.—On the geological results of the railway diggings between Rakonitz and Beraun, by H. Wolf.—On the occurrence of antimony near Eperies, by L. Manderspach.—On the ores of Laurion in Attica, by A. Schlehan.—On some new silver ores from Joachimsthal, by J. v. Schröckinger.—On the lime of the Acropolis of Athens, by Dr. M. Neumayr.—On the environs of Predazzo and on the Monzoni mountains, by Dr. C. Doelter.—On the interior structure of the Offenbánya mining district and on that of the Boitza district, by F. Posepny.—On some petrifactions from the Kalnik mountains, by Dr. R. Hörnes.—On some slaked stone mounds in Bohemia, by Dr. J. Woldrich.

PARIS

Academy of Sciences, June 28.—M. Frémy in the chair.—The president welcomed M. Janssen in the name of the Academy on his return to Paris, and M. Janssen made some remarks in reply.—The following papers were read:—On the explanation of numerous phenomena which are consequences of old age, by M. Chevreul.—On the work in course of execution at the Observatory, by M. Leverrier. Among other observations it is proposed to carry on a series with a view to constructing magnetic and meteorological charts of France. Magnetic observations made in the Peninsula of Malacca, by M. Janssen. The observations were undertaken with a view to fixing the present position of the magnetic equator, which the author found to pass between Ligor and Singora. A meridian was found also in which the magnetic declination was 0°. This note is dated from Singapore, May 16.—On the distribution of magnetism in a thin bar of great length, by M. J. Jamin.—On the cyclone at Châlons; second examination of facts and conclusions, by M. Faye.—On the distribution of an acid among several bases in solutions, by M. Berthelot.—On the hydrocarbons produced by the distillation of the crude fatty acids in presence of superheated steam, by MM. A. Cahours and E. Demarcay. The authors found in a sample of oil from Fournier's stearine candle factory the following hydrocarbons: amyl, hexyl, and heptyl hydrides; likewise the hydrides of octyl, nonyl, decyl, undecyl, duodecyl, and cetyl.—Note on tabular electro-magnets with multiple cores, by M. T. du Moncel.—Note accompanying the presentation of the first volume of the "Analytical and Experimental Demonstration of the Mechanical Theory of Heat," by M. Hirn.—Influence of compressed air on fermentation, by M. P. Bert.—Memoir on the earth's motion of rotation, by M. E. Mathieu.—Study of electric discharges through fine metallic wires, by M. Melsens.—On the influence of magnetism on the extra current, by M. Trène.—Chemical equivalence of the alkalies in the ashes of various vegetables, by MM. Champion and H. Pellet.—On the presence of hydrogen dioxide in the sap of vegetables.—On the work of the expedition commissioned to study the project of a central sea in Algeria, by M. Roudaire.—Solar parallax deduced from the combination of the Noumea with the Saint-Paul observations, by M. C. André.—On the numerical values of the musical intervals in the vocal chromatic gamut, by M. Bidault.—New sounding flames, by M. C. Decharme.—Action of chlorine on isobutyliodhydric ether, by M. Prunier.—On the portative force of M. Jamin's magnets, by M. A. Sandoz.—New apparatus relating to respiration, by M. G. Carlet.—Of the influence of the noxious *Solanaceæ* in general, and of belladonna in particular, on Rodents and Marsupials, by M. E. Heckel.

BOOKS AND PAMPHLETS RECEIVED

AMERICAN.—The Birds and Seasons of New England: Wilson Flagg (Trübner and Co.)—Annual Report of the Board of Regents of the Smithsonian Institution (Washington).—Important Physical Features exhibited in the Valley of the Minnesota River. An Essay, by G. K. Warren (Washington).—Proceedings of the American Philosophical Society.—Transactions of the Academy of Science of St. Louis. Vol. iii. No. 2.—Bulletin of the Essex Institute, 1874.—Report of the Geological Survey of Missouri, U.S., and Atlas to same

FOREIGN.—Notizblatt des Vereins für Erdkunde. 3te Folge, 13tes Heft (Darmstadt).—Nach den Victoriafällen des Zambesi, von Eduard Mohr. 2 vols. (Berlin, Ferdinand Hirt und Sohn).

CONTENTS