THURSDAY, NOVEMBER 11, 1875

SEVENTH REPORT OF THE SCIENCE COMMISSION

THE present Report deals with the University of London, the Universities of Scotland, the University of Dublin and Trinity College, and the Queen's University in Ireland. With regard to the University of London the Commission has few suggestions to make, though it is of opinion that the Matriculation Examination would have a still higher value than it has if a Practical Examination could be instituted in connection therewith. "The enforcement of a practical test would accelerate the introduction of practical work into school teaching, and would thus exert a very favourable influence on the Progress of Scientific Education."

The Commission is also of opinion that the University of London should follow the example of the University of Edinburgh, and award the degree of D.Sc. only to those who have given proofs of the desire and capacity to make some addition to scientific knowledge.

The greater portion of this Report refers to the Universities of Scotland. The Report begins by referring to the inquiry conducted by the Commissioners appointed under the Universities (Scotland) Act of 1858, and to the reforms instituted by them. The recommendations made by this Commission were, however, controlled by the fact that the sum to be provided by Parliament to carry them out would not exceed 10,000*l.* a year. The Universities Commission kept very much, therefore, to the old lines, making classical learning the foundation of a University course, and prescribing for graduation in arts, a course extending over four winter sessions, and including "attendance on the Classes of Humanity, Greek, Mathematics, Logic, Moral Philosophy, and Natural Philosophy:" and, in addition to these, "attendance on a course of English Literature," which previously had not been required in any Scottish University except that of Edinburgh.

The Commission observes with satisfaction that in the Scotch Graduation Examination it is clearly recognised that a fair training both in literature and in science is the best basis for further advances in either the one direction or the other. They suggest, however, that the student should be allowed to show the required proficiency, whether in science or literature, by passing an examination at such a period in his University career as will enable him, in the latter part of his academical course, to devote his attention systematically to a particular group of subjects.

In referring to the examinations for the degrees of Bachelor and Doctor of Science, the Report states that recently a regulation has been made at Edinburgh that each candidate for the degree of D.Sc. must submit a thesis containing "some original researches on the subject of his intended examination, and such thesis must be approved before the candidate is allowed to proceed in his examination." It seems quite astonishing that this, which has for generations been the rule on the Continent, has not been done in all our Universities long ago. Degrees of an essentially similar kind have been instituted in Glasgow.

The most important part of the Report on the Scottish Universities is concerned with the deficiencies in respect to assistants and apparatus. In some cases the rooms are not at all adapted to the kind of teaching that must be carried on in them. The laboratory accommodation is throughout glaringly deficient, and ill-adapted for practical work. Indeed, if we except Glasgow, where new buildings have recently been erected, practical teaching can scarcely be said to exist, and now that it has come to occupy so large a space in the higher education, it is not to be wondered at that the scientific professors feel completely hampered in carrying on their work. Happily, in the case of Edinburgh this state of matters is likely soon to be remedied; 80,000*l.* have been already subscribed to build a new medical school, so as to leave the present buildings for the other departments of the University.

With regard to assistants, all the Universities are also miserably deficient, the deficiencies being attributable to the inadequacy of their resources. There are certain funds available for assistants to the scientific as well as to the other professors, but these are so scanty that in some cases the science professors have to provide additional assistants out of their by no means munificent incomes. The apparatus also, in connection with the scientific chairs, is discreditable to the Universities and quite inadequate to the modern requirements of scientific teaching.

In the case of the Universities of Edinburgh, Glasgow, and St. Andrews, the Commissioners recommend that Government augment their grant sufficiently to enable the Universities to increase the number, and, in some cases, the emoluments of assistants; to make more ample provision of apparatus for teaching; and to revise the salaries of the scientific professors.

In the case of Edinburgh it is recommended that such assistance be given, both in the form of a capital sum in aid of a scheme of extension, and of an annual grant.

The Report also deals shortly with the Andersonian Institute, or "Anderson University" of Glasgow, founded under the will of John Anderson, Professor of Natural Philosophy in Glasgow University towards the close of last century. There is no doubt it does good work among those who cannot afford a regular University education; many students in Arts and Medicine get their education here. It has been suggested that this Institute receive a charter, but the Commissioners wisely decline to support such a suggestion.

A movement was set on foot some time ago to establish a Science School at Dundee, about twelve miles from St. Andrews, across the Firth of Tay, which is being bridged for a railway. The Commissioners, however, cannot recommend any scheme which would involve the St. Andrews professors travelling to and from Dundee to teach, or which would remove the scientific chair to that town.

For some reason the University of Aberdeen has declined to avail itself of the opportunities afforded it of tendering evidence before the Commission.

With regard to the two Irish Universities, that of Dublin and the Queen's University, the Commissioners report very favourably on the portion allotted to science in these two institutions.

In the Dublin University there are thirty-three fellowships, which are tenable for life, irrespective of the restriction of celibacy, and are now open to all without distinction of creed. The Commissioners think that it would be very desirable that in the election to Fellowships important original research should be regarded as a substantial element of merit.

The nature of the constitution of the Queen's University, Ireland, and its three colleges at Belfast, Cork, and Galway, is well known. The education to be obtained at these colleges is fairly complete, both on the scientific and literary side, and the examinations imposed by the University are such as to make its degrees of real value.

The evidence shows that the appliances for teaching are in some respects insufficient, and that there is a serious deficiency of funds for maintaining the efficiency of the Queen's Colleges in this respect. The Report concludes and recommends as follows with regard to the Queen's University in Ireland:—

"In founding the Queen's Colleges, the State did not adopt the principle of assisting and stimulating local efforts, and if we except the exhibitions and prizes, to which reference has been already made, as having been provided by public subscription, and a few other exhibitions which have been founded at Belfast, no voluntary contributions have been received by them. They are institutions for which the State has made itself responsible, and in which, as part of a University system, a complete scientific training is implied.

"As we think it of great importance that the sanction of the State should not be given to the teaching of science on a scale inadequate to ensure its efficiency, we recommend (1) That an increased annual grant be made to the Queen's Colleges for the purpose of providing assistants, apparatus, and the other necessary appliances of practical scientific teaching. We further recommend (2) that the Professorship of Natural History in the Queen's College, Belfast, be separated from that of Geology and Mineralogy."

The general conclusion reached, then, in this Seventh Report is that it would take very little to make London University nearly perfect as an examining and degree-granting body; that Dublin University is in a healthy condition, and by a little amendment in the subjects of examination for her Scholarships and Fellowships, she might be an example to her sister Universities in England; that the Queen's University, Ireland, and the four Scottish Universities are all working in the right lines, and that what they mainly require in order that they may develop into perfectly efficient teaching bodies, so far as science is concerned, are funds to provide the necessary men, buildings, and apparatus. No doubt the recommendations of the Commissioners in reference to these and other matters will receive serious attention in the proper quarter.

HERMANN'S "ELEMENTS OF HUMAN PHYSIOLOGY"

Elements of Human Physiology. By D. L. Hermann, Professor of Physiology at the University of Zurich. Translated by Arthur Gamgee, M.D., F.R.S. (London: Smith, Elder, and Co., 1875.)

FOR a considerable time a first-class work on the Elements of Physiology in our own language has been a desideratum. The bulky Handbook by Carpenter was framed in a nearly bygone era of the science; Kirkes' smaller volume is under a similar disadvantage; Huxley's excellent little book does not appeal to others than beginners, and the "Handbook to the Physiological Laboratory," by Drs. Sanderson, Foster, Brunton, and Klein, was never intended to fill the place of a manual. Dr. Gamgee steps forward to fill the gap with a carefully conducted and excellent translation of the fifth edition of Prof. Hermann's deservedly esteemed "Elements of Physiology," a work unequalled in the care which has been bestowed on the collecting and balancing of the investigations of authors from all quarters, as well as in its general construction and inherent unity of design.

Dr. Gamgee tells us, "After much hesitation and many doubts I decided not to annotate the text, for had explanatory notes, of the nature of commentaries with illustrations, been added to it, as I once intended, its appearance would have been still further delayed, and the work would have been materially altered in character—it would have ceased to have been Hermann's Physiology." We have a sufficiently high estimation of Dr. Gamgee's ability to think that the English reading public are the sufferers from his change of determination. The work being Hermann's therefore, and not in any way Gamgee's, except as far as the translation is concerned, our remarks apply only to the former.

The subject is treated in four sections, or parts. The first is entitled "The Exchanges of the Matter of the Organism"; the second, "The Activities or Energies of the Body"; the third, "The Liberating Apparatus; the Nervous System"; and the last, "Origin, Development, and Death of the Organism." As in most works on general subjects written by authors with any special predilections, the space devoted to the different functions is not quite that which would suggest itself to the unbiassed reader. As an instance of this in the present case we may refer to the fact that the account of the organ of sight alone occupies more than one-eighth of the volume, and nearly three times as much space as that devoted to the circulation of the blood.

The first part treats of the chemical constituents of the human body, the blood, and the circulation. The most advanced method of notation is adopted, and Baeyer's observations on the relations of uric acid are incorporated.

In the chapter on the blood we find one section devoted to the death of that fluid, the expression being employed to indicate those effects which follow its withdrawal from the influence of the walls of the living vessels. With reference to the movement of the blood in the circulatory system, we cannot help feeling that there is considerably more that might have been said about it with advantage, and that it might have been treated in a more connected and precise manner. Too much stress is laid on the aspiratory power of the thorax, which is assumed to be so continuous that "an ordinary expiration merely removes the inspiratory increase of the negative pressure." The duration of the systole of the ventricles of the heart is said not to vary with differences in the pulse-rate, according to the observations of Donders, which have been since shown to be incorrect. We are also led, incorrectly, to infer that the blood-pressure in the ventricles at the end of the diastole is a negative one; that the

force of gravity is one of those which aids the circulation; that "all those vessels which carry blood *to* a capillary system are called arteries;" that in "scaly amphibia"—by which we assume reptiles are meant—the two ventricles always communicate, which is not true as far as the crocodiles and alligators are concerned; and that the heart of a warm-blooded animal, removed from the body, will continue to beat "so long as a supply of oxygenated blood is provided."

The term "secretion" in its widest sense is said to denote "all those processes in which substances quit the blood in an altered or unaltered condition." This involves the inclusion of that simple nutritive diffusion into tissues which results in the origin and growth of bone, cartilage, &c.; an unnecessary complication, we cannot help thinking, and one apt to mislead. When it is stated that "nothing is known about the formation and regeneration of bone-tissue, except the morphological appearances presented in the various stages," justice is not done to Dr. Beale's most ingenious and highly probable explanation of the process by which it comes into existence.

The second portion of the work discusses the energetic relations of the body. Parts give indications of having been evolved from the author's inner consciousness, when he might have appealed to sound fact. On the whole we prefer the way in which the subject is treated in Dr. Pavy's excellent work on "Food." Prof. Hermann's theory of muscular contractility, based entirely on slender analogies, does not impress itself on our attention more than does the not less satisfactory one of Dr. Radcliffe.

The "liberating" or "discharging" apparatus, in other words the nervous system, occupies the third section of the work. As our knowledge of the nerves is very superficial, remarks the author, it must suffice to establish empirically the conditions which increase, diminish, or destroy irritability. This is done in a most exhaustive and excellent manner. Prof. Hermann regards the phenomenon of electrotonus as an effect of contact, the contents of nerve-tubes which are dying or in activity being negative to the contents of nerve-tubes which are living and at rest. The chapters on special sense will be read with particular interest, from the masterly manner in which they are written. Why so much space is devoted to the horopter, a surface the physical relations of which are as much connected with stereoscopic photograph cameras and double magic lanterns as with eyes, we do not know. With regard to the author's ideas on the recent views promulgated by Hitzig, Fritsch, Nothnagel, and Ferrier, we will quote his own words. "The movements which have recently been induced by electrical stimulation, since they do not occur after mechanical or chemical stimulation, may very well be set down to the irritation of more deeply seated regions, for the latter are unavoidably exposed to the diffusion of currents. . . . . No results as to the nature and distribution of the functions of the cortex, even of the value of approximations, can be deduced from these experiments."

In the fourth section of the work a short account is given of the development of the embryo, not detailed enough to be of much service, except to the initiated.

This rapid glance at the contents of Prof. Hermann's work indicates that it adopts a method of treatment that is more modern than most. In perusing it in detail the incorporation of the results arrived at in all directions by physiologists during the last twenty years, makes its value still further apparent. The many conflicting statements which have sometimes to be made, without any explanation being given, leave several questions without any definite answer. Such must for some time be the case in a science so young as physiology. The authorities for the different statements introduced are given in every case where there might be any doubt, and the book would have been still further serviceable if references had been introduced to the publications in which the results are described, as well as to the author's name. Many, in looking through the work, will feel that much of the method and many of the phenomena there explained, which, although they have not made their way into our text-books, have been current in the oral tradition of physiological circles; they must remember that a considerable amount of capital has been made out of foreign investigations by those who have done little more than dole them out in a different language from that in which they originally appeared.

The arduous task of translation has been most conscientiously performed by Dr. Gamgee, who has evidently weighed, carefully and acutely, the unavoidably difficult forms of expression employed, many necessarily quite new on account of the novelty of the conceptions developed. Taking for example the word "Schwellenwerth," as employed with reference to Fechner's psycho-physical law which is shortly explained; at the suggestion of Dr. Sanderson it has been translated "liminal intensity," an expression which does not at first sight explain itself, as does "initial intensity," the rendering which first occurred to Dr. Gamgee. In physics "initial" is employed of velocities, and we are not sure that any other term was necessary.

In conclusion, there is no doubt that the appearance of this work has greatly reduced the need, at the present time, for any other treatise on the Elements of Physiology.

WHITE CONQUEST

White Conquest. By William Hepworth Dixon. Two vols. (London: Chatto and Windus, 1876.)

MR. DIXON has been again in America, this time to collect evidences of the struggle between the races that is being waged on that wide battle-field. Although his method of treating the subject is not such as quite to bring his work within the critical sphere of NATURE, and although the author makes no attempt to treat his subject scientifically, still even the scientific reader, the student of ethnology or of the characteristics of the various races of men, and he who takes an interest in the struggle for existence wherever it is being carried on, will find much in Mr. Dixon's striking pictures well fitted both to interest and instruct. It is not in our province to criticise the quality of the artistic element in the work, but about its fascination there can be no doubt. Of course the work is one-sided. We do not use the term by way of depreciation, but in its literal sense. Mr. Dixon's aim is to represent, by means of a

series of sharply outlined and brilliant pictures, the most prominent and often the most unpleasant features of the great struggle out of which it is evident the white race must come victorious.

The regions with which the work is mainly concerned are the Pacific States, especially California, and also the States on the Gulf. In the West, especially, the fight is a regular *mêlée* between white men, red men, black men, and yellow men. Very striking indeed is Mr. Dixon's account of the means by which the Chinese are rapidly asserting for themselves a place of the first importance in and around San Francisco, notwithstanding the disgusting and degrading habits of the majority of them.

When the heat of the struggle is over, when the country is again sufficiently populated, and the people have settled down to a life of steady progress, what will be their characteristics, physical, intellectual, and moral? It is an interesting question, an intricate problem, which we fear it would be difficult to work out beforehand. In a recent number we referred to the valuable paper by Prof. Wilson, of Toronto, detailing his observations on the relations between the whites and the Indians, especially in Canada. His conclusion is, that in accounting for the disappearance of the American Indian, too much prominence has been given to extermination and too little to absorption. He produces data to show that a very considerable amount of red blood has been absorbed by the white intruders, and that aboriginal traces are to be found widespread among all classes of society. Moreover, that it is difficult to find a pure Indian, and that the half-breeds who now mainly represent the old proprietors of the soil have excellent stuff in them, and are being constrained gradually to settle down to a civilised life. The conclusion is, that in the end a homogeneous race will result, having no doubt large white characteristics, but at the same time showing unmistakeable marks of a red ancestry.

Where one race intrudes itself forcibly into a country already populated, and has to fight its way to find a place for itself, this mixture is inevitable; the men who do this rough work cannot as a rule take their own women with them. Some of the most impressive pictures in Mr. Dixon's work are connected with this subject, and show how inevitable it is that under the circumstances alluded to, a large half-breed population must arise. We are sorry to see, however, that Mr. Dixon does not speak so well of the half-breeds as Prof. Wilson does, though this may arise from the fact that those of Canada have as a rule more white blood than red in their veins. In the end, which approaches with accelerating speed, when homogeneity is attained, the United States will be populated by a race of very mixed blood indeed, though it is evident to everyone but a pessimist, that the brain and sinew and muscle which dominate in the Old World will, both in quality and quantity, in intension and extension, to use logical terms, bear the sway on the other side of the water. The great stumbling-block in this, as in other respects, in America, is the Negro, the "culled gemm'n," as he now calls himself. Extermination does not appear likely to be his fate, and "absorption" in his case seems a mighty long way off.

Two of the most interesting chapters in Mr. Dixon's works refer to education in America, and will somewhat surprise those who fancy that America has a system of education as thorough and uncompromising as that of Germany. While Mr. Dixon has evidently presented here almost exclusively the dark side of the education question in America, there is no withstanding his statistics. Still, all things considered, especially looking at the heterogeneous population, ever largely increasing from the outside, with which American educationists have to deal, both the extent and the quality of education in the United States do the citizens infinite credit.

While, we repeat, Mr. Dixon's work makes no pretensions to be scientific, still we are grateful to him for bringing before us so brilliant and attractive a series of pictures of a struggle which is indeed only the continuation, further westwards, of that which was begun far back in prehistoric times by the ancestors of those whites who at present seem likely to be victors and lords all the world over. We fear that after all, however much we may plume ourselves on our superior culture and advanced civilisation, might is still with us, as with our predecessors, right; and perhaps after all, both on scientific and humanitarian grounds, it is only right that it should be so.

OUR BOOK SHELF

Elementary Analytical Geometry. By the Rev. T. G Vyvyan. (London: George Bell and Sons, 1875.)
Conic Sections treated Geometrically. By W. H. Besant, F.R.S. (Same publishers.)

THERE is little calling for special notice in Mr. Vyvyan's work. The fact of its having reached a third edition is a clear indication that it has met with acceptance. New chapters have been added on focal properties of conics and on abridged notation and trilinear co-ordinates; the central conics are discussed together; and the chapter on the general equation has been enlarged. There is a good selection of exercises. The work is reduced in price, and now forms one of the publishers' series of Cambridge School and College Text Books.

The new matter in this second edition of Mr. Besant's "Conics" is confined to little more than two articles. The errata of the first edition have been carefully removed, and we have detected only some half-dozen simple typographical mistakes. Between thirty and forty new examples have been added. We notice that in consequence of a few slight alterations, in some four or five cases, the same figures come on to opposite pages, a fact easily accounted for when we know that the work is now in its second edition.

We presume that though Mr. Besant in his Introduction still states that "a knowledge of Euclid's Geometry is all that is necessary," he does not thereby mean us to infer that a like knowledge of geometry obtained from other and more modern text-books would not answer as well. It is not necessary to say anything in praise of a work so well known and prized as this as a text-book of Geometrical Conics.

Die Periodischen Bewegüngen der Blattorgane. Von Dr. W. Pfeffer, A.O. Professor in Bonn. Mit 4 lithographirten Tafeln und 9 Holzschnitten. (Leipzig: verlag von Wilhelm Engelmann, 1875. 8vo., 176 pp.) (The Periodic Movements of Leaf-organs. By Dr. W. Pfeffer, Extraordinary Professor in Bonn. With 4 lithographed plates and 9 woodcuts. Leipzig: W. Engelmann.)

THE essential character of periodic movements as defined by Pfeffer is their being recurrent. All "repeated" movements, whatever their cause and mechanism may be, are periodic. Recurrent or periodic movements are of diffe-

rent kinds, and it is necessary carefully to distinguish between them. Thus certain periodic movements occur only during the growth of the part, and cease entirely when the structure has become full-grown ; and the term "nutation" is restricted by Pfeffer to these recurrent movements during growth. In other cases periodic movements occur which are not determined by the growth of the part, but are due exclusively to the elongation and contraction of certain portions of tissue ; and these latter are called by Pfeffer "movements of variation." These movements of variation which occur so commonly in the Leguminosæ are due to the action of more or less joint or hinge-like portions of the leaf. Nutations on the other hand which occur in very many leaves or petioles are due to unequal growth of the tissues, and not to the presence of a joint. As the movements of nutation are dependent on the growth of the part, they cease when growth ceases ; and as the zone of maximum growth of the part changes its position, so also the seat of the nutation will vary. The movements of variation have a very different character, as they continue when the leaf is full-grown, and naturally, as they depend on a definite structure having a fixed position, they do not change their place during growth. The two forms of movement are very closely related, and jointed parts during growth often exhibit movements of nutation, thus showing the close relationship that exists between the two.

Periodic movements, whether movements of nutation or of variation, are either entirely independent of external stimuli, or are conditioned by them. The former class are the "autonomous" or "spontaneous" movements, the latter are the "paratonic" or "induced" movements—"Receptionsbewegungen," and depend on the paratonic action of external agents, as, for example, light and heat. As a consequence of the paratonic action, the leaf makes, in addition to the simple to-and-fro pendulum-like movement, certain further oscillations with decreasing amplitude, which Pfeffer calls "Nachwirkungsbewegungen," but which for want of any better word we may call simply secondary movements. It is by the help of these "secondary" movements that Pfeffer explains the peculiarities of the daily periodic movements of plants. The first chapter of the work now before us is devoted to these general remarks on the movements.

The second chapter treats of the mechanism of the induced movements evoked by alternation in illumination, the so-called sleeping and waking of plants. These movements are either movements of variation, as in the *Phaseolus vulgaris*, or they are movements of nutation, as seen in the leaves of *Impatiens noli-me-tangere* and the flowers of *Leontodon hastilis*. The measurements of the movements are made by an instrument described and figured by Pfeffer as the Lever Dynamometer.

The third chapter treats of the daily periodic movements. The subsequent chapters treat of such subjects as the mechanism of the daily movements, the intensity and internal causes of the movements, the influence of temperature and gravity, autonomous movements, and the like. A short chapter is devoted to the distribution of periodic movements. From it we learn that movements of variation are common in plants belonging to the Leguminosæ and Oxalidaceæ. All the plants of an order do not necessarily show movements of variation. Thus in the Euphorbiaceæ they occur in Phyllanthus ; while in Euphorbia we have movements of nutation. A short historical review and *résumé* of results concludes this most interesting volume. W. R. M'NAB.

Jahresbericht der Meteorologischen Centralstation Carlsruhe über die Ergebnisse der an den Meteorologischen Stationen des Grossherzogthums Baden im Jahre, 1874, *angestellten Beobachtungen*. (Bearbeitet von Oscar Ruppell.)

THIS report gives a very satisfactory discussion, by opious tables and accompanying remarks, of the meteorological observations made at sixteen stations in the Grand Duchy of Baden during 1874. In addition to the tables usually printed in such reports, the temperature is given for the five-day means at all the stations. The monthly means of temperature, humidity, pressure, &c., include also the means of the separate hours of observation,—a feature of the report which deserves, from the important practical questions it throws light upon, to be more generally followed. The tabulation of thunderstorms shows each day on which these phenomena occurred at each of the stations. This method is greatly to be preferred to giving only the gross number for the separate months, since the data so published will be available in determining the periodicity of thunderstorms through the year,—an inquiry with which many interesting inquiries are intimately bound up. It is unnecessary to remark that 16 stations are miserably inadequate as a representation of the rainfall over the diversified surface of the Grand Duchy. Future reports will doubtless show a large increase to the staff of rain-observers. The daily pressure is given for two stations, Carlsruhe (404 ft.), and Höchenschwand (3,322 ft.), but unfortunately only the mean of the three daily observations is given, instead of one, or, better still, the whole three observations, it being only observations at particular hours which can be turned to account in charting the weather.

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.*]

Dr. Richardson's Hygeia

THE eloquent address in which Dr. Richardson has sketched the possible Health City of the future might furnish matter for much discussion—among other points, the probable statistics of the community. The author contemplates the possible reduction of the death-rate to 8 per 1,000 in the first generation, and to 5 or less in the next, as suggested by Mr. Chadwick. It sounds simple enough to talk of knocking 1 or 2 per 1,000 from a death-rate, and, so long as the rate is tolerably high, such as 20 or more, the effect is not so startling, but when we come to such low figures as 8 and 5 the difference becomes enormous. Thus, whereas a diminution from 21 to 20 raises the expectation of life by only 1½ years, a fall from 9 to 8 raises it by 9, from 6 to 5 by 21 years, and from 5 to 4 by 40 years. We should thus have at 8 per 1,000 death-rate an expectation of life of 86 years, and probable mean duration of 120, whilst there would be cases of old people living to 160. Again, at 5 per 1,000 the ages would be respectively 137 years for expectation at birth, and old people living on to 250 ; at 4 per 1,000 the expectation would be 177, and old people would live to beyond 330. Compare these figures with Dr. Richardson's closing address, where he claims a modest 90 years as the proper length of human life.

Another aspect of the case is the probable increase of population, which we may thus calculate :—The mean birth-rate of England for the last 35 years is 33·8 ; if the death-rate be 5 the net increase would be 28·8 per 1,000. At this rate the population of Great Britain and Ireland would reach 66,000,000 by the year 1900, and, by the year 2000, no less than 1,120,000,000, or about the present population of the inhabited globe. At the same time the model City of Hygeia would more than double itself by the end of the present century, whilst, by the end of the next, its population would be 3,450,000, or as nearly as possible that of our overgrown metropolis. What check does Dr. Richardson contemplate to this inordinate hypertrophy?

F. DE CHAUMONT

Photography in the "Challenger"

WHEN the *Challenger* was fitted out, I was asked to prepare certain special dry photographic plates to go with her. I wished to give them the sensitiveness of wet collodion and unlimited keeping qualities, and the following letter from the chief photographer on board is very satisfactory. The stains alluded to on

some occur from the shifting of the packing papers, and the faces of two plates then coming in contact :—

"H.M.S. *Challenger*, Yokohama, 15th June, 1875.

"Sir,—It gives me great pleasure to acquaint you that the dry plates supplied to this ship three years ago are working well, being *fully* sensitive, notwithstanding the great trial that they have been subjected to—extreme cold and heat. On some plates I found damp spots on the film, which stain the picture, and hence I discard them; but, on selecting plates, I travelled up 2,500 feet (where the wet process seemed impossible) and obtained *perfect* negatives. I would suggest that more substance be placed between the plates, as I have found them sticking together, and hence the same spots on each plate. I am using your new developer, which works well.

"I remain, yours obediently,

(Signed) "JESSE LAY, Photographer.

"To Col. Stuart Wortley."

If at any time any scientific worker may be contemplating an expedition where highly sensitive dry photographic films might be of use, I shall be glad to place my experience at his disposal, and give him formulæ on which he can thoroughly and implicitly rely. H. STUART WORTLEY

Patent Office Museum, South Kensington, Nov. 8

Bees and Clover

IN NATURE, vol. xii. p. 527, it is stated that two nests of English humble-bees have been sent out to New Zealand, and that they are specially desired there for the purpose of fertilising the common clover. I suppose the red clover is meant, as the white is fertilised by the hive-bee, and the wonderful rapidity with which it has spread over the Australian colonies proves that it does not require any further assistance.

The species of *Bombus* sent out is not mentioned in the paragraph, and it is not likely that Mr. Frank Buckland would send the wrong one; but it is worth pointing out, as not being generally known, that the commonest of the humble-bees (*Bombus terrestris*) does much more harm than good to many of our flowers. I have for several years watched the humble-bees, and I never saw this species go to the mouth of the corolla of the red clover. As far as my experience goes, it invariably bites a hole at the base of the flower and extracts the nectar from that opening, so that it is of no use in carrying the pollen from one flower to another. All the other species of humble-bees that I have noticed go to the mouth of the flowers, and they alone are useful in their fertilisation.

The common scarlet-runner or pole-bean is entirely dependent on the visits of bees for the fertilisation of its flowers, and I have lately seen an instance where the attentions of *Bombus terrestris* were mischievous and hurtful. A friend of mine, living near Finchley, had a late sowing of scarlet-runners rendered barren by their operations. The smaller humble-bees did not visit his garden, and *Bombus terrestris* cut holes at the base of both the expanded flowers and the unopened buds. The hive-bee with some trouble, by pushing between the petals, can get at the nectar and sometimes fertilises the flowers, but as soon as the humble-bee commences to cut holes at the base it seeks for these perforations as a readier means of access.

At the beginning of the season some of the *Bombus terrestris* will be seen visiting the flowers of the scarlet-runner in a legitimate manner, but they soon learn that it is easier for them to get at the nectary by cutting holes at the base, and later on their acquired experience teaches them to attack the buds in the same manner. Large gaping flowers such as the Nasturtium and the Fox-glove are fertilised by this species, but to most of the narrow tubular ones its visits are injurious.

I hope therefore that it is not *Bombus terrestris* (the common large yellow-banded kind) but some other species of the genus that has been sent to New Zealand, and if so it will be a most valuable addition to the fauna of the country should it be successfully acclimatised.

In sending humble-bees to a distant country I believe the best plan would be to dig up the fertilised queens, in winter, out of the ground where they hybernate, and forward them in their dormant state packed in earth kept cool by ice.

Cornwall House, Ealing THOMAS BELT

Cherry Blossoms destroyed by Squirrels

THE very general interest exhibited in your columns some time since in regard to the destruction of flowers by birds, leads me to report the following observation.

I have noticed repeatedly here in New England that the common red squirrel (*Sciurus Hudsonius*, Pall.) is extremely fond of flowers, and I am inclined to believe that in this immediate vicinity he destroys far more flowers than any bird. The squirrel in question, though smaller than the common squirrel of Europe (*S. vulgaris*, Linn.), bears a close resemblance to the latter. We have field-mice also whose habits so closely resemble those of the squirrel that it seems highly probable that mice as well as squirrels often aid in the destruction of flowers. For cherry blossoms in particular our squirrel has a well-nigh insatiable appetite.

Having lived for several years upon the edge of a considerable belt of woodland, I have been surprised to witness the extent of the devastations of the squirrel in this particular, and have watched their operations with no little interest. The flower is bitten from its stalk precisely as a nut would be, and held between the paws of the animal while the little ovary at the base of the blossom is eaten. All this is the work of but a moment, since the edible morsel is exceedingly minute. The flower is then dropped to the ground, seemingly in a perfect state, since the petals are untouched, and remain adhering to the calyx. I have noticed that one squirrel working by himself will destroy in this way two hundred blossoms or more in the early morning of a single day. On examining the discarded flowers it appeared that they were in no wise mutilated excepting that the ovary had been bitten from the pedicel in every instance. Freshly opened flowers seem to be preferred. At all events the very first blossoms of the spring are eaten, and the destruction of flowers is largest in the early days of the blossoming. As soon as the flowers have become somewhat mature, the squirrels leave them, and they neglect the immature cherries also until near the time of ripening, when they again attack them, both for the sake of the fleshy part of the fruit and of the kernel. With respect to the fruit, however, the squirrels are far less harmful than birds, since the latter descend upon it in overwhelming force. The red squirrel has long been detested by American gardeners because of his destruction of pears, the choicest of which he gnaws in two, for the sake of their seeds merely, but I am ignorant whether anyone has hitherto called attention to his fondness for the blossoms of fruit-trees.

I have occasionally noticed the rose-breasted grosbeak (*Guiraca Ludoviciana*, Linn.) plucking cherry blossoms, or perhaps the unopened flower-buds, at the same time with the squirrels, but the birds ate leaf-buds from an adjacent ash tree as often as they ate the cherry flowers, and the number of blossoms destroyed by the birds was insignificant in comparison with the work of the squirrels.

F. H. STORER

Bussey Institution of Harvard University, Oct. 20

Plagiarism

A FRIEND has just called my attention to the letter of Mr. Boyd Dawkins in last week's NATURE under the head of "Plagiarism." Mr. Dawkins may have found out by this time that he has made a mistake to my detriment, but I am bound to reply to his letter.

The map accompanying the article "The Early Geography of the British Isles" (*Leisure Hour*, July 1874), which Mr. Boyd Dawkins says is a reproduction of one he published in 1871, is in reality the well-known map first issued by Sir Henry de la Beche more than forty years ago, with the addition of hypothetical river-courses (indicated in the first instance by Mr. Godwin-Austen) and submerged forests, the said river-courses having since been more completely and strikingly pourtrayed by Mr. Dawkins, whilst I have added to the submerged forests.

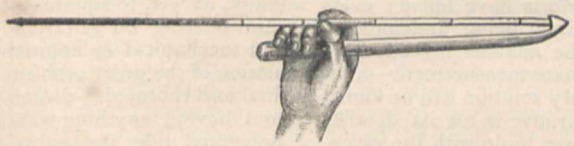
The *Leisure Hour* map is thus a composite production. Beneath it, so far from there being no reference to its various authors, are the words: "After Sir Henry de la Beche and Mr. Godwin-Austen, F.R.S." (I regret to find Mr. Dawkins's name is not placed on the map as well); whilst in the text of the article are the words: "See a paper by Mr. Boyd Dawkins, F.R.S., in 'Hardwicke's Popular Science Review' for October 1871."

I can only suppose Mr. Dawkins had not given due attention to the *Leisure Hour* map and its accompanying article when he wrote his letter off San Francisco. If he had, I disallow his exclusive claim to the one hundred fathom line of the British seas, the submerged forests, and (with the modification above mentioned) the hypothetical river-courses.

8, Walterton Road, W., Nov. 8 HENRY WALKER

Curious Australian Implement

IN NATURE, vol. xii. p. 544, a correspondent points out the resemblance existing between an implement used by the Ute Indians and one belonging to the Australian natives, which he calls a vermin hook. May I venture to suggest that he may possibly have mistaken the use of the latter? It appears to me to be identical with the instrument used by all the Australian "river" blacks to throw their light reed spears with, which consist of a heavy miall wood point and a shaft of reed. The bone hook is inserted in the head of the reed, the spear resting between the forefinger and thumb of the hand that holds the thrower and lying parallel to it, thus :—



the spear being propelled from the hooked end of the thrower, which is rapidly brought forward into a vertical position, thus propelling the spear before it. During several years on the different Australian rivers, I saw the weapon universally used as above, but neither there nor elsewhere in the colonies for any other purpose.

J. P. GLOVER

Derby, Oct. 29

OUR ASTRONOMICAL COLUMN

VARIABLE STARS.—The following are the Greenwich mean times of geocentric minima of Algol, occurring before 14h., to the end of the present year, according to the elements employed by Schönfeld for his later ephemerides :—

	h. m.		h. m.		h. m.
Nov. 14 ...	11 42	Dec. 4 ...	13 24	Dec. 27 ...	11 57
,, 17 ...	8 30	,, 7 ...	10 13	,, 30 ...	8 46
,, 20 ...	5 19	,, 10 ...	7 2		

The first heliocentric minimum in 1876, with the epoch and period of Schönfeld's second catalogue of variable stars (1875), occurs on January 2, at 5h. 34·5m. G.M.T., or January 2·23226 ; the minima throughout the year will be obtained by the successive addition of 2^d 86729. For times of geocentric minima, corrections must be applied to the times so calculated, which may be found from

Corr. to heliocentric minimum = 7·67m. R. sin. (S + 35°·69),

where R is the earth's radius-vector at the date, and S the sun's longitude.

The period of Algol, which had diminished since 1782, at first slowly, but afterwards more rapidly, after remaining constant or nearly so for a time, appears to be again slowly diminishing.

According to Schmidt, of Athens, the brightness of Algol is equal to that of δ Persei about 47 minutes before and after minimum, to that of ε Persei about 62 minutes before and after the same, and to that of β Trianguli 95 minutes before and after. The fluctuations extend over about 9¼ hours.

There is a suspicion of variability about the light of the small companion of this star, first remarked by Schroeter. Smyth measured it in 1835. During the last two years it has sometimes been readily visible and at others discernible with difficulty with the same instrument ; but a systematic course of observations is required to decide if there be a real variation.

According to Schönfeld, S Cancri will be at a minimum on Nov. 14 at 16h. 50m., Dec. 3 at 16h. 3m., and Dec. 22 at 15h. 17m. G.M.T.

For U Geminorum it appears very difficult to make a prediction likely to be of any service, so that very frequent examination is necessary for the determination of the times of maximum. Mr. Otto Struve states that this object does not usually disappear in the Pulkova refractor. Schönfeld thinks the period varies between 70 and 150 days. A secondary minimum has been remarked on several occasions about the time of greatest light. In most periods the star has not continued visible in ordinary telescopes more than a fortnight, and occasionally less. Winnecke has given a list of the small stars in the vicinity of U Geminorum, which will be useful in its identification (See *Astron. Nach.*, No. 1,120). At maximum this star is a little brighter than an average ninth magnitude in Bessel's scale.

THE MINOR PLANETS.—There are this week three additional discoveries to record. No. 151, by Palisa, at the Observatory of Pola on the Adriatic on Nov. 1, place at 13h. 24m. local mean time in R.A. 3h. 2m. 17s., and N.P.D. 71° 40' ; No. 152, by Paul Henry, at Paris on Nov. 2, place at 11h. in R.A. 2h. 38m. 17s., N.P.D. 74° 35' ; and No. 153 by Palisa, on Nov. 2, place at 12h. 40m. in R.A. 3h. 1m. 28s., N.P.D. 72° 25' ; all three are of the twelfth magnitude, or somewhat fainter. In Prof. Tietjen's Berlin Circular he transposes the above numbers for the planets discovered on Nov. 2, but upon what ground does not appear ; according to the times of observation given in the first announcement of discovery, the Paris planet should precede that detected at Pola. No. 150, which was found by Watson at Ann Arbor on Oct. 19, soon after his return from Europe, has been observed at Berlin, Düsseldorf, Leipsic, and Pola, and No. 151 on the night after discovery, at Berlin.

Though in certain cases it may be necessary to use caution in announcing the discovery of a new small planet, the actual positions of several of those already observed being very imperfectly known, there appears every probability that the three just brought to light are really new. No. 138 (Tolosa) is probably near the ecliptic in 3h. R.A., but some thirteen or fourteen degrees to the east of Palisa's objects, as will be found from the elements of Gruber, calculated upon the six weeks' observations in June and July 1874. The rough approximations to the orbits of Dike and Camilla at present obtained, place the former in the 5th hour of R.A., and upwards of 34° N. of the equator, and the latter at the beginning of the 4th hour, but at a considerable distance from the ecliptic, or with a N. declination of 8° or 9°. The position of No. 137 (Melibœa) is open to great uncertainty, the observations so far published extending over sixteen days only, and an orbit founded upon them would be of little service so long after the date of observation. A circular orbit appears to have been computed by Dr. Becker at the time, as he published a short ephemeris in the *Astronomische Nachrichten*—but the elements were not appended. Even with the shortest period yet assigned to any member of this group of planets, Melibœa would hardly be so far advanced in R.A. at the present time.

No. 97 (Clotho), in opposition on Nov. 9, is now very little below an eighth magnitude in Argelander's scale. The calculated places for Berlin midnight are—

	h. m. s.	° ′
Nov. 12	R.A. 3 22 2	N.P.D. 93 30
,, 16	,, 3 19 1	,, 93 52
,, 20	,, 3 16 2	,, 94 9
,, 24	,, 3 13 12	,, 94 20
,, 28	,, 3 10 35	,, 94 24

BESSEL'S WORKS.—With No. 2,061 of the *Astronomische Nachrichten*, Dr. Engelmann, formerly attached to the Observatory of Leipsic, issues a prospectus of an important astronomical publication, entitled "Abhandlungen von Friedrich Wilhelm Bessel," in which it is intended to reprint a selection of upwards of 130 of the more important papers, &c., of the great Königsberg astronomer. Many of these are now scattered in works which are often costly and difficult to procure, and the proposed collective edition of the principal memoirs cannot fail to be of vast service to the astronomical student. The selection which has been made will be contained in three

volumes, the first of which is to appear in the present month, the second in the spring, and the third during the summer of 1876, and will be arranged under the following divisions :—(1) Motions of the Bodies of the Solar System ; (2) Spherical Astronomy ; (3) Theory of Instruments ; (4) Stellar Astronomy ; (5) Mathematics ; (6) Geodesy ; (7) Physics, and (8) Various. A portrait and short life of Bessel is to be attached to the first volume. Dr. Busch's complete list of Bessel's works, inclusive of astronomical notes in various scientific periodicals, as the *Monatliche Correspondenz* of Zach, the *Berliner Jahrbuch*, &c., which is appended to vol. xxiv. of the Königsberg Observations, contains 385 titles ; but many of the shorter contributions being of minor or ephemeral interest, it is probable that the selection proposed will include all the writings of the illustrious astronomer which can now possess value.

*AMONG THE CYCLOMETERS AND SOME OTHER PARADOXERS**

II.

MR. H. HARBORD, who hails from Hull, has put forth three letters, with which we have been favoured. "The Circle Squared" (in November 1867) has, we guess, been noticed by Prof. De Morgan. There is a nicely drawn diagram, two concentric circles, two squares, said to be their respective equivalents, all in black ; an equilateral triangle and its circumscribing circle in red ink ; the former is described on a side of the smaller square, and the red circle passes through the extremities of the same side. A statement is made, which appears to be a statement and nothing more, for it proves nothing. From "Squaring the Circle" (April 15, 1874) we learn that the writer has leisure (*fons et origo mali!*), and so has ventured to amuse himself by considering the relation of the equilateral triangle, the square, and the circle. He obtains the positive altitude of an equilateral triangle on a side of the square to be 7'754485597711125, and requires the exact side of the square and the proportion of the triangle to the square and the equivalent circle. He winds up, like many of his race, with the following reflections :—"I think if the learned in geometry, mathematics, and trigonometry, abandoned approximating theories, and would take the trouble to elucidate the above-stated propositions, they would undoubtedly be able to subvert all anomalous and vague theorems, free the study of geometry, &c., from ambiguity, enable tutors to explain correctly, remove burthens imposed on the mind of the pupil, and establish a system of teaching which shall be correct and intelligible, for it is evident the result of minute calculations proves there is no mystery in geometry, mathematics, or trigonometry ; they are uniform, and may be more easily taught and comprehended with perfect truthfulness without approximation." To prevent trouble, this man of leisure appends the rule ; it is : Add one-seventh to the altitude, and we get the base ; and so on. Not satisfied with the above remarks, we have a note to the "learned" (see above) : and it is the following curious sentence :—"It is worthy of remark, and more especially to those who are interested in the forthcoming 'Transit of Venus,' when the true distance of the earth from the sun is to be determined, and a difference of about three millions of miles accounted for, to be in a position to prove the fact. Now all this can be accomplished by anxious, minute observation and correct calculation !" He then appends (we don't see the connection) : "Length of an arc of one degree, '017 . . . to twenty-seven places final." We got the last communication a few days ago ; it is, "Construction of the Perfect Ellipse" (Dec. 22, 1874). This is a fine large figure on a sheet of paper some eighteen inches by fourteen. He finds that the true ellipse is only to be described on the perpendicular of the equilateral triangle. Mr. Harbord has evidently an idea, and that is, that the equilateral triangle is the key to unlock many geometrical mysteries.

Mr. Michael Callanan, of Cork (September 1874), "is in a position to demonstrate before any appointed number of scientific gentlemen, the perfect quadrature of the circle, rendering it as clear as the most simple, plain (*sic*) rectilineal figure. The Circle, that colossal mystery, to prove the area of which has been looked upon as the climax of geometrical science ; and, although the object of search by the mathematicians of all nations, their greatest efforts have failed ; every attempt, as yet, to square the circle being undemonstrable, and offering no reward to the anxious investigator beyond mechanical or approximate measurement—a manipulation of the great problem. My solution will be found original and thoroughly demonstrative in all its details, without having anything whatever to do with the given or polygonal rules for approximation. Entirely new ground is opened up in the path of science which I have chosen, guided only by positive mathematical laws, combined in the most strict logical arrangement, and thus *proved to demonstration*. I now proclaim the absolute fact of being able to set aside for ever any further doubt as to the complete quadrature of the circle, and thereby confound those scientific prophets who pronounced it an impossibility." Local circumstances offer many impediments in bringing the matter before the scientific world, and "being a geometrical secret, the law of Patent cannot be applied." He then puts himself in the same position with other inventors and discoverers, but he asks for an accredited tribunal "from which I would ask an impartial hearing, so as to verify these statements, and also to be identified and protected as the discoverer." For this end he is willing to attend at any selected place in England, Ireland, or Scotland. He then glances at some of the immediate results in the realisation of this problem. "At the proper time will be published a comprehensive work, including all the new diagrams necessary to carry out and complete the demonstration." And this is all we know of Mr. Callanan's "Secret of 'the Circle' solved."

Our next claimant for notice is not a Circle-squarer, but he would certainly have got a warm corner in the "Budget." Middleton's "new process of measuring the height of the sun," an observation for latitude demonstrated by geometry, proving the sun's height less than the latitude of observer. On this leaflet our paradoxer says, "the sun's height is under 3,000 miles." The principles of this discovery are published in the *West Londoner*. Mr. Empson E. Middleton, *Poet* (Naval and Military Club), sends us a further document (May 5th, 1873) : "£100 Reward to the first who disproves the following Diagram—Middleton's Geometrical Proof that the Earth is Flat." Proof is said to turn upon the SPHINX SOLUTION,—"a globe demands six cardinal points." Having disposed of this point to his satisfaction, he "challenges all the mathematicians to support their statement that a perpendicular line and a line at right angles are the same ; one is *flat*, the other *upright*. I undertake to prove that the perpendicular line is *not* the same as a line at right angles, though the two are utterly confused in every school-book of the day. I undertake to meet in public and to confute any of our mathematical professors who may have the manliness to come forward and discuss this question of the perpendicular, a question which forms the fundamental basis of the whole science of geometry, and is of the very first importance. I remain faithfully, to the Majesty of Truth." Mr. Middleton has published a translation of "the first two books of the Æneid of Virgil" to supersede Mr. Connington's (*sic*) : he has a work "On Space" unpublished, and one "On Man" awaiting demand.

Naturally, after this we should turn to Parallax, or to

* Concluded from vol. xii. p. 560.

Mr. John Hampden, but we have preserved nothing from either of these paradoxers. The former has gained notice in the *Budget* (we are sorry to record the recent death of another able opponent of these views, Mr. T. T. Wilkinson, F.R.A.S.); the latter has figured before the public in the daily papers. A consequence of Mr. Wallace's acceptance of Mr. Hampden's wager is that the former gentleman has for nearly five years been the subject of continuous libels (see letters in *Daily News*, March 11, also March 9). It is to be hoped that an enforced retirement of a twelvemonth will result in Mr. Hampden's learning wisdom and the keeping of the peace towards Mr. Wallace and all others.

In De Morgan's account of Taylor the Platonist (*B* of *P*. pp. 182, &c.) there is nothing said of an early work of his, "The Elements of a new method of Reasoning in Geometry applied to the rectification of the Circle" (1780), "a juvenile performance lost or suppressed" (biographer in *Penny Cyclopædia*). We have examined this work, but it is impossible to give an account of it here; the solution is approximative.

The malady (*Malus cyclometricus*) is not confined to the Old World; our concluding instances will be drawn from a Geometry published at New York, and from a treatise specially devoted to the subject and printed at Montreal. We have not a copy of Mr. Lawrence S. Benson's "The Elements of Euclid and Legendre, with Elements of Plane and Spherical Trigonometry," but he has sent us "A Reply to Criticisms on Benson's Geometry." This will answer our purpose better, for the defence shows that the malady is confirmed. The symptoms are even more exaggerated than in Mr. J. Smith's case, for whereas his circumference ("Budget," p. 318) shrank into exactly $3\frac{1}{8}$ times his diameter, Mr. Benson's has shrunk to only 3 times! Where all this will end if the malady increases it is hard to say; perhaps the unfortunate circle will shrink up into its own centre! Opponents had pointed out "that when the areas of polygons inscribed in the circle are computed by means of plane triangles, a result is obtained for the inscribed polygons greater than $3R^2$," and they reasoned (it seems to us irresistibly) "that it is impossible for a circle to be less than a figure inscribed in the circle." Mr. Benson trusts, however, that after fourteen years' application to mathematics he will not be thought to have committed so egregious a blunder as to bring himself into direct contradiction of the self-evident proposition, "A part is less than the whole." He commences his defence with the statement that Torelli contends that the circle will be proved to be the square on its diameter exactly as 3 to 4. He then goes on to instance that Playfair ("Euclid," p. 307) demonstrates that Torelli's proposition is true on *two conditions*. Is it credible that Mr. Benson should proceed to say: "The fact that the proposition is true 'on two conditions' prevents the proposition from being *false*, for a false proposition can be true on *no* condition." The conclusion of the whole matter is that he replies to the inquiry, "How is it that reasoning from plane triangles for the computation of the areas of polygons, and reasoning from the ratios of rectangles, when they are all rectilinear magnitudes, that different and conflicting results are obtained?" that "the reasoning on the *ratios* and *rotation* of surfaces involves their *relation* to each other; whereas the computation of the plane triangles involves their *boundaries:* and since for the QUADRATURE OF THE CIRCLE *the relation between the circle and a certain rectangular space is required*, it is evident that the proper mode of reasoning is by means of the relation of the ratios of the small rectangles inscribed in the circular spaces to the ratios of the sums of those rectangles, or of the whole rectilinear figures; or by means of the rotation of rectilinear and curvilinear surfaces around a common axis—and not by the process of continually doubling the number of sides of the polygons described about the circle; since the sides do not reach the circumference, this process gives an approximate result only, which is inconsistent with the strictness of geometrical reasoning." We do not profess to follow the writer's reasoning, but hold fast by the *terra firma* which he appears to discard.

"The Circle and Straight Line" is a work got up in an elaborate and elegant dress: it consists of Parts I., II., III., and a supplement in brown binding, and a duplicate of the supplement in green (there is a portion of a flyleaf additional in the former supplement, or else the two copies appear to be identical). Further, there is with each a book of plates, all most clearly drawn, and the diagrams protected by slips of tissue paper. Evidently the author, John Harris, or Kuklos, is not a needy man. Let us gather from Mr. Harris's preface the object he has in view. Deeming the solution of the geometrical problem which demonstrates the relation of the circle to the straight line to be peculiarly of public importance, he gives a statement of what he has done in the matter. "The discovery of the solution was communicated by letter, dated 29th of December, 1870, accompanied with demonstration, &c., to the Astronomer Royal." There was, the author admits, imperfection and error in the case as then presented. The Astronomer Royal declined to examine the case. In January 1873 the papers were presented to the President of the Royal Society (still Sir G. B. Airy), "with a request (claim) in writing to have the case judicially examined by that Society." The documents were returned; they met with a similar fate at the hands of the Professors of M'Gill College. The subject is to describe a circle (or circumference) equal in length to a given straight line, and to draw a straight line equal in length to the arc of a circle, "accompanied with demonstration that the conditions of the requisition have been mathematically fulfilled. We publish our solution with the distinct statement that it is essentially in strict accordance with that scientific system known as Euclid's. We claim to have our demonstration admitted or disproved, and we challenge objection or adverse argument on that system." We shall first convince our mathematical readers, on Kuklos's own summing up ("Corollary," p. 34), that he is wrong, and then, on the charitable supposition that he is willing to be convinced, point out where we consider he has failed. We shall take the last sentence of the Corollary cited above: "Wherefore, if a square be inscribed in a circle, the ratio of the inscribed square to the circle is the ratio of nine to ten." It will be seen that this gives for the value of π, $\frac{20\sqrt{2}}{9}$, that is 3·142696; not a very close approximation to the accepted value. But, of course, in arguing with Mr. Harris we must go over his work and point out, if possible, where he has tripped. We commence with enunciating his Theorem A.: "If an arc containing one-eighth of a circle be applied upon a straight line, and from the terminal extremity of the arc a perpendicular be drawn intercepting the straight line, and if from the arc one-tenth thereof be cut off, then, if the remaining arc (to wit, the arc containing nine-tenths of the whole arc) be rolled upon the straight line, the point of contact shall be the same point on the straight line intercepted by the perpendicular drawn from the terminal extremity of the whole arc." *B M*, *B n* are taken to be the two arcs, and *O*, *d* are taken to be the corresponding points to *M*, *n*, on the tangent at *B*, also *D* is the foot of the perpendicular from *M* on the same tangent. Mr. Harris's object is to show that *D d* coincide: *if* they did, then we would admit that he has proved his point; but on p. 22, line 13 (all his previous working having been sound, though somewhat tediously put), he has "*c d*" instead of *C D* (his *c d* is a misprint, we presume, for *C d*), and then easily gets to his desired conclusion. We would ask him *how* he gets "*C d*." Again, on p. 24, third line from bottom of page, we tell him that "*D O* is one-tenth of *B O*" is a cool

assumption, and we also ask him how he gets the last line on p. 27. These crucial points occur in "independent proofs" of the same theorem; they are pure "beggings of the question," we believe. This is all we have to say on Part I. Part II. opens with an admirable motto (reminding us herein of Mr. James Smith), "Prove *all* things; hold fast *that* which is *good*." Having *proved* then the previous theorem, he *holds* fast to *that*, and proceeds to the "construction of the circle;" his object being "to make manifest the great importance of the circle as one of the fundamental facts belonging to the Plan of Creation." As we consider the foundation wrong, until Prop. A is proved, we shall not follow the writer through the twenty-four pages of rather obscure mathematics devoted to this subject. We come next to "Mathematics and the Art of Computation." Starting from what he has (as he thinks, we will say) just proved, viz., that "the difference of the quadrant and the chord of the quadrant is an aliquot part of the quadrant and of the chord, and that the number of those equal parts contained in the chord being nine—the quadrant contains ten": because he finds in this "conclusive evidence that the (so-called) Arabic system of notation is is not an artificial human contrivance, but a great natural fact of a primary character, a fundamental part of the Science of Creation." Further down he speaks of many persons preferring "with a strange, and, as it would seem, with an increasing perversity, to cultivate the *thorns and thistles*, leaving the *good seed* as not worth utilising." He is then careful to state that by "thorns and thistles" he does not mean the modern methods of mathematical analysis. Still, "is it, or is it not, true that the language of mathematics is fast becoming an unknown tongue to ordinarily educated men, and that those to whom it is known can scarcely hold converse with their fellows (on any scientific subject) in ordinary language without a feeling of condescension, and scarcely without a feeling of impropriety? . . . . Is it true that the mathematician does now, *in some degree*, regard his fellow-worker who is unpractised in the calculus and non-conversant with differential methods as but little better than a publican and heathen?" We will not undertake to answer this question, but perhaps our author's ground for this opinion is the reputed division of the human species by the "Cambridge Wrangler" into those who understand the differential calculus and those who do not. He himself goes on to say, "If it be true that such a result does manifest itself in any considerable degree, it may be pronounced decidedly unwholesome and bad—bad for science and bad for civilisation—because mathematical knowledge is a necessity to science and a necessity to civilisation." This we admit. He then reiterates the statement that he knows that examination will show his demonstration of the quantitive (*sic*) ratio of the perimeters of the circle to the diameters is "mathematically incontestable." He then goes into an examination of Prop. XIII., Book V., of Brewster's Legendre: "The surface of a regular inscribed polygon and that of a similar polygon circumscribed, being given, to find the surface of the regular inscribed and circumscribed polygons having double the number of sides." Among other objections, he objects to the italicised statement (Prop. XIV., "Legendre"), "We shall infer that the last result expresses the area of the circle, which, *since it must always lie between the inscribed and circumscribed polygon*, and since these polygons agree as far as a certain place of decimals, must also agree with both as far as the same place." His objection to the whole method is "in the omission to observe that comparison has to be made between a continuous curved line (the circle) and a continuous straight line (the diameter)." And then, as elsewhere, he indulges in metaphysics. Part III. begins with Curvature and ends with Theology. "A human science which does not distinctly recognise the primary truths of theology as its ultimate basis, is not based on reality; it has not and cannot have any actual and secure foundation. If the science of England is not so based, no matter what seeming progress may for a time be made, whenever the trial comes it will be as the house built on the shifting sand, and, if not destroyed by sudden catastrophe, will eventually become a ruin, together with the civilisation which rests upon it." Our safety then, we presume, Kuklos would have us believe, is to believe in $\pi = \frac{20\sqrt{2}}{9}$. The supplement has "Supplementary Illustrations" and Tables. The work is printed at Montreal.

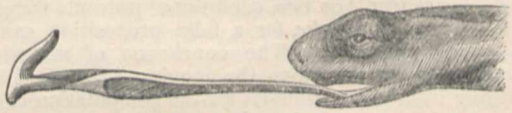
The conclusion of the matter is, that there are Cyclometers and Cyclometers. We have endeavoured to give a fair presentment of the several kinds by giving as far as possible their views in their own words. The majority of their writings evidence great waste of ingenuity, which, had it been otherwise directed, might have resulted in works of utility instead of in such utterly trivial work as it has done.

To any who may be thinking of taking up this "curiosity of literature," not having done so hitherto, we say emphatically, "Don't."

SCIENCE IN GERMANY

(*From our own Correspondent.*)

IN Wiedersheim's recently published book, "*Salamandrina perspicillata* und *Geotriton fuscus*," two very little-known tailed amphibians (Urodela) are described and compared anatomically, which, by their entire organisation, stand at the two opposite limits of the Salamandrinæ that are known to us, representing the highest and the lowest form of these. *Salamandrina perspicillata*, which is rather a land than a water animal, seems to be found only in the western half of Italy; it is a prettily coloured, small, and slender animal, which lives on insects, and during the dry summer months continues in a kind of summer sleep, but in winter it is found in full vital activity. In its skull are almost entirely wanting the cartilaginous parts denoted as the "primordial cranium," so that in this it rises above all other Salamandrinæ, and comes near the Reptiles. In accordance with this, also, is the existence of a cavity in the base of the skull (sella turcica), the prolongation of the frontal bone (frontale) into the eye cavity, and a roofing-over of the latter; lastly, the absence of a special nose-partition (which, again, quite characterises the Reptiles). On account also of the course of development of its vertebræ, and the numerous bones of its carpus and tarsus, *Salamandrina perspicillata* must stand at the top of the Salamandrinæ; its divided kidneys, again, suggest the reptile, so that we must look on this animal as a form rendering



Tongue of *Geotriton fuscus*.

possible the transition from the Amphibia to the Reptilia, and which, on account of its peculiarities, might represent a separate family. *Geotriton fuscus*, on the other hand, holds quite a different position. If, in view of the numerous anatomical relations adduced, we are able, commencing with *Salamandrina perspicillata*, and passing through the various water salamanders (Tritons), to the land salamander (*Salamandra maculata*), to form a descending series of ever less-developed forms, *Geotriton fuscus* comes at the lower end of the series, for in many respects it ranks with the lowest Amphibia generally, the Perennibranchiata. Indications of this appear in the fewness of bones in the skull and the tarsus, the extended double cone form of the soft-cartilaged vertebræ;

then, too, the joint processes are wanting, &c. On the other hand, *Geotriton* is distinguished in the most peculiar way, by one organ, from all other Amphibia, viz., by the tongue. This is a pedicelled disc, like a mushroom, on the bottom of the mouth cavity, where it is connected with the tongue-bone apparatus; the latter, however, does not merely consist of the same parts as in other Amphibia, but at its two hinder ends there is attached on either side a long thin cartilage, which reaches, free between the neck muscles and the skin, as far as the back, and is enclosed in an envelope of special muscles, which are only attached at its hinder end and in front to the rest of the tongue-bone. If, now, this muscle be contracted, it thrusts out the cartilage rod, and with it the tongue, in a way similar to that observed in Chameleons, Woodpeckers, and Ant-eaters. Compare the annexed drawing. Thus Nature connects in the most remarkable manner a complicated organ of the higher Vertebrates with the organisation of amphibians that evidently stand very low.

EVIDENCES OF ANCIENT GLACIERS IN CENTRAL FRANCE

WHEN visiting the Mont Dore district, in Central France, with Prof. Huxley in the summer of 1873, my attention was accidentally directed to some magnificent transported boulders occupying the floor of an elevated valley due south of the highest ridge of the Pic de Sancy.

These, though gigantic, and occupying a very conspicuous position, in every respect similar to positions occupied by deposits from ancient glaciers in Switzerland and in all other Alpine regions, are not alluded to in Le Coq's exhaustive work on Central France, or his geological map appended thereto; nor are they in either of Mr. Scrope's works on the Volcanoes of Central France; nor can I obtain any information regarding them from those of my geological friends who are most versed in glacial phenomena.

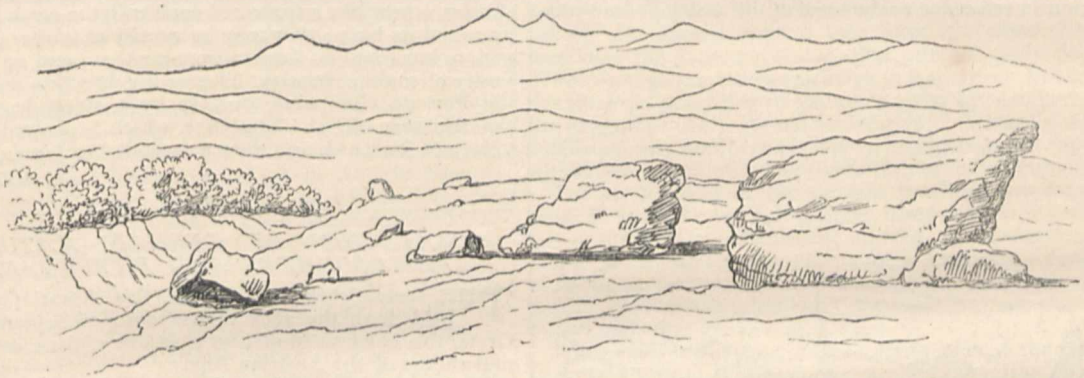


FIG. 1.—Transported blocks in the Tranteine Valley, Mont Dore. Mountains of Cantal in the distance.

Under these circumstances, though still of opinion that they cannot have escaped the notice of French observers, if not writers, on the geology of France, I may assume that they are of sufficient novelty and interest to render the accompanying notes and sketches acceptable to the readers of NATURE.

The well-known lofty range of Mont Dore is described by Scrope ("Volcanoes," ed. ii., p. 362) as a mountain mass rising in its highest peaks more than 6,200 feet above the sea-level, composed of beds of trachytic and basaltic lavas, alternating with their respective conglomerates. And again, in his "Volcanoes of Central France" (ed. ii., p. 124), the same author says of the figure of the mass, that it is best understood by supposing seven or eight rocky summits grouped together within a circuit of about a mile in diameter, from which, as from the apex of a flattened and somewhat irregular cone, all

FIG. 2.—Transported block in the Tranteine Valley, Mont Dore (estimated length 36 feet). Pic de Sancy (N.) in the distance.

the sides slope more or less rapidly, the mass being deeply and widely eaten into on opposite sides by two principal valleys, those of the Dordogne and the Chambon.

It is with the southern valley, or that of the source of the Dordogne river, that we are concerned, the head of which occupies a noble amphitheatre facing the south, immediately under the highest summit of Mont Dore. My companion and myself were on our way to the summit of the Pic de Sancy, from the village of Latour about seven miles to the westward; we were skirting the rocky and very steep sides of the amphitheatre at an elevation of some 5,000 feet, and were enjoying the view of the snow-streaked mountains of the Cantal which bounded the horizon to the southwards at nearly forty miles' distance, when my attention was arrested by some large objects on the broad and level (as seen from a height) floor of the valley at our feet. They were presumedly huts, haystacks, or glacially transported blocks, and their position in reference to the head of the valley and amphitheatre so strongly inclined me to the latter view, that I determined on visiting them before leaving the neighbourhood. Accordingly, on the following day, I took the high road to Latour, south-eastward to the village of Chastail. Then leaving the road, I descended and crossed a small stream to the eastward. The ascent of its steep opposite bank led through beechwoods to a broad flat ridge with some cheese-makers' huts upon it, from which, still proceeding eastward, I descended by a gentle slope immediately upon the floor of the valley, and found myself amongst a group of magnificent boulders that had evidently been deposited by an ancient glacier which had flowed from the rocky amphitheatre at the head of the valley.

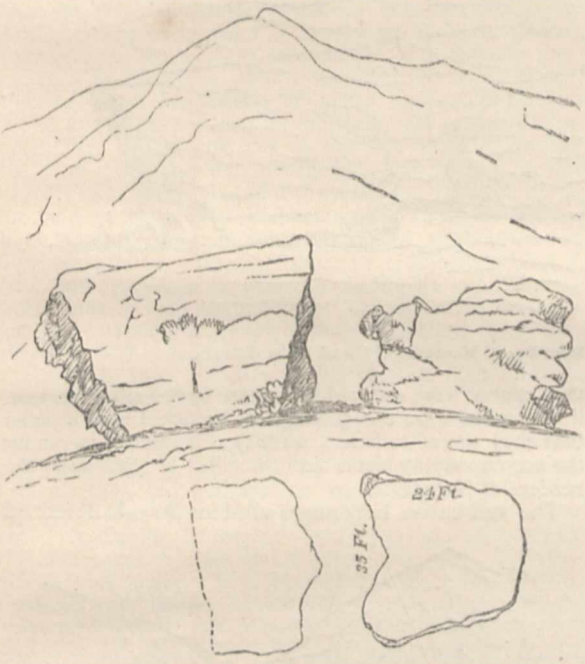


FIG. 3.—Transported block split into two pieces in the Tranteine Valley, Mont Dore.

The blocks were of trachyte, and what I took to be domite, of the same nature as the rocks towards the top of the pic; they were scattered over an undulating surface, which I guessed to be about half a mile long by a quarter of a mile broad, and occupied both the floor and the very gentle slopes of this part of the valley, up to perhaps 200 feet above the stream. Others were seen further down the valley, which however soon contracted; its stream, which meandered in the position of the greatest number of blocks, becoming, beyond it, a torrent. For about a mile above this there were no blocks; that is, between my position and the base of the steep cliffs forming the amphitheatre where the glaciers had descended. The largest blocks were those furthest down the valley; at least twenty of them appeared to me to be upwards of as many feet in length, and one of greater length was also of greater height. Several were split in two, like blocks that had been fractured by falling through the crevasse of a glacier. All were weather-worn and covered with lichens, ling, and grass.

Returning I took a north-westerly direction, ascending the spur I had crossed in coming, passing close under a magnificently mountainous mass of basalt to the east of the Puy de Pouge. Still further eastward and south of this Puy are meadows where brood mares and foals are grazed, upon which were a few large blocks of trachyte or basalt artificially shaped into very odd forms, some like skittles, others like a truncated cone with the earth heaped up round its base; they may be worthy of further investigation, but I had no time to examine them and no opportunity of making inquiry. Thence my direction lay under the Puy de Compaine, and so by a steep descent to the Ruisseau de la Chambasse, which I followed to the village of Sarsenae, and thence ascended to Latour.

J. D. HOOKER

ASSOCIATION OF GERMAN NATURAL PHILOSOPHERS AND PHYSICIANS

THE forty-eighth meeting of this Association was held from the 18th to the 25th of September at Gratz, the chief town of Styria, in one of the most beautiful valleys of the Austrian Alps.

The Association is the oldest of its kind; founded in 1822, and preceding, therefore, by several years, the birth of its British sister. In times of political disturbances and wars, such as the years 1848, 1866, and 1870, it held no meetings; in several previous years the German Governments, who in days gone by regarded every public meeting with suspicious eyes, prohibited them, and thus forty-eight meetings only were held during the fifty-four years of its existence. The German "Naturforscher-Versammlung" owes its formation to one of the founders of comparative anatomy, the celebrated Oken, late Professor of Zoology at Jena, and it cannot be denied that politics entered into the intentions of its founder as well as of many of its original members. When German unity was nothing but a treasonable aim of persecuted patriots, every meeting of Germans from different States served to spread and to give fresh vigour to this aim, and was in itself a protest against the division into small States of the common country, and against persecutions such as Oken himself has had to suffer. Aye, even now, when the old wishes have been fulfilled and no division separates Government and nation, remains of the old political undercurrent can still be traced in some of these meetings.

Gratz has an entirely German population, whose sympathies with the new German realm are increased by their proximity to Slavian provinces. It has taken a prominent part in the Reformation, and although brought back to the old religion by threats of fire and sword, by the establishment of Jesuit colleges and the suppression of the Protestant University once graced by Kepler, it still glories in its old recollections and carries high the banners of freedom and of its German nationality. In 1842, the "Naturforscher-Versammlung" was invited to Gratz and gave to that town a foretaste of the right of association then proscribed in Austria, and in 1875 the town opened her gates once more to her non-Austrian brethren, principally to assert her intellectual unity with Germany. This idea, and their enthusiasm for the freedom of thought, formed the

chief contents of the opening address delivered by Prof. Rollett, and of the welcome tendered by Dr. Kienzel, the chief magistrate of the town. The Government was represented by the lord-lieutenant of the province and by an under-secretary of the Board of Agriculture, while the Minister of Public Instruction welcomed the meeting in a letter excusing his absence. The Emperor Francis Joseph had contributed largely to the costs of the meeting. But this did not prevent his Government from interfering with the hoisting of the flags of Germany, which were destined to greet the visitors on their entrance into the town. It would naturally be supposed that the sympathy evinced by the town of Gratz would have been responded to by large numbers of German visitors. In this respect, however, the meeting was destined to be a disappointment, without any very prominent reason to account for it. Most likely a good many reasons contributed to this result: such as the distance of the place of meeting from the centre of Germany, the bad aspect of monetary matters, the day chosen for the assembly, which, lying in the middle of the summer vacation, prevents visitors from taking journeys into distant countries. Again, some of the branches represented in the Association have commenced to hold separate meetings: the geologists, the astronomers, the societies for the improvement of public health, for ophthalmotology, psychiatrics, and surgery, hold separate annual meetings independent of the Association of Natural Philosophers and Physicians. Lastly, certain events that have lately taken place in Austria seem to have deterred German members of the Association from visiting the Austrian Empire. It will be remembered that some of the most prominent German professors of the University of Prag have been all but forced to leave their posts, and that the vacillating policy of the Austrian Government wishes at present to reconcile the Slavian population by excluding as much as possible German influence from Austrian Universities.

The number of visitors at the meeting of Gratz was 715 members, 1,567 associates, and 1,700 lady associates. Of the 2,282 male visitors, 1,705 belonged to Austria (1,141 being residents of Gratz), and 546 to the German Empire; 114 of the latter being residents of Silesia, the nearest German province. Seventeen Russians, four Swiss, three Turks, two Swedes, two Roumanians, and one visitor from England, one from Italy, and one from America make up the total. It will be seen that this number corresponds very nearly with the average number of attendants at the British Association.

This, of course, is a merely fortuitous resemblance. But many other points indicate that the British Association has been modelled from the German pattern. Both Associations are convened for the same number of days; both hold the same number of general and sectional meetings; they resemble each other in the nature of the recreations offered to visitors: excursions, dinners, concerts, to which in Germany (and Austria) are added balls and theatrical performances, while England has the private hospitality of its nobles and rich manufacturers and merchants to offer, which do not enter into the German programme or certainly do not appear in it to the same extent. A festivity of a peculiar character in addition to those named was offered by the municipality of Gratz: an illumination by bonfires of the mountains surrounding the town, a sight of most impressive beauty.

Generally speaking there are no evening meetings in Germany, and the festivals being of a public nature (not depending upon private hospitality), the connection between the visitors is greater than it is at the British meetings. A peculiarity of the German meetings is the absence of a president; two chargés d'affaires (*Geschäftsführer*) being nominated to conduct the business of the Association, one a natural philosopher, one a physician. Professors Rollet and L. von Pebal occupied these positions in Gratz. The sections nominate new presidents for each of their daily meetings. A consequence of this arrangement is a certain want of formality. No retrospective introductions are offered at the opening of the sectional meetings, no criticisms of the work of fellow-workers by more or less competent critics, no sweeping remarks on the state of science in general, which happen to be the more disparaging the less the critic himself is actually engaged in contributing to the advancement of the branch of science he is discussing.

In two respects the British Association has an indisputable advantage over the German meetings. Those splendidly illustrated evening lectures addressed to the general public, which form one of the attractions of the meetings in the United Kingdom, are not offered in Germany.

Again, the funds of the German Association are small; they are spent for the purposes of each meeting, and no money can be given in grants for scientific purposes as is done in Great Britain. There are therefore no general and no sectional committees in Germany. On the other hand, the German Association offers the advantage of a speedy publication of its transactions. Instead of publishing an annual volume long after the close of the meetings, the German Association offers a daily paper (*Tageblatt*) giving the proceedings in a more or less condensed form according to the notes given by members to the general or the sectional secretaries. Generally some supplementary numbers are issued, completing the report within one month after the conclusion of the meeting.

The papers read at the general meetings are mostly given in full. At the first general meeting at Gratz, after the opening ceremony already alluded to, the Arctic explorer, Lieut. Weyprecht, gave a most interesting review of Arctic explorations, and at the same time a curious and stirring piece of self-criticism.* Amongst the most characteristic passages are the following:—

"Originally it was the wish for material gain, in the shape of fur and fish-oil, that prompted Arctic exploration. Later on this cause was replaced by the ambition of geographical discoveries such as are easily understood by the general public. The running after this sort of fame gradually assumed such proportions that Arctic exploration became a sort of international steeplechase towards the North Pole, a system opposed to true scientific discoveries. Topographical geography must be subordinated in Arctic regions to physical geography. Geographical discovery derives its value only from scientific discoveries connected with it. The exploration of the great and unknown latitudes near the poles of our globe must be continued without regard to the expenditure of money and of life which it demands. But its ulterior aim must lie higher than the mere sketching and christening in different languages of islands, bays, and promontories buried in ice, and the mere reaching of higher latitudes than those reached by our predecessors. One reason of the indifferent results of previous expeditions is that they have been unconnected with each other. The progress of meteorology consists in comparison, and every success it has obtained, such as the laws of storms, the theory of winds, &c., is the result of simultaneous observations. The aim of future Arctic explorers must be to make simultaneous observations, extending over the period of a whole year, with identical instruments and according to identical rules. In the first place, they will have to consider natural philosophy and meteorology, botany, zoology, and geology, and only in the second place the discovery of geographical details. I do not intend in what I said to depreciate the merits of my Arctic predecessors, whose sacrifices few can appreciate better than I do. In giving utterance for the first time to these opinions, which I have taken time in forming, I complain against myself, and I condemn the greater part of the results of my own arduous

* Some of the chief points in this address we gave in NATURE, vol. xii. p. 539.

labours. I will conclude by announcing that the future participation of Austria in such an enterprise has been secured by the generosity of a man who has already made several sacrifices in the interest of Arctic voyages."

The Mæcenas of the new expedition alluded to but not named in this announcement is understood to be Count Hans Wilczèk.

Weyprecht's manly speech was followed by great applause, and has already produced the effect of inducing the Commission appointed by the German Government to examine the question of expediency of a new expedition to the North Pole, *not* to recommend the despatch of a new expedition, but the establishment of stations of observation in northern latitudes.

The second general meeting selected Hamburg for its place of assembly in 1876, and appointed the chief magistrate of the town, Burgomaster Kirchenpauer, and Dr. Dantzel, to manage affairs. Prof. Behn brought before the meeting the plan of a society for the assistance of scientific men in reduced circumstances.

Dr. Günther then gave a very interesting lecture, to which, unfortunately, no abridgment could do justice, on the aims and results of the history of mathematics; followed by Prof. Benedict on the history of crime with regard to ethnology and anthropology. He touched upon delicate ground, asserting that every action is based less on liberty than on compulsion; that our acts are governed by natural laws and not by theological opinions, and that punishment may act as a corrective of perverted human nature, but is chiefly the outflow of the desire of society to avenge wrongs inflicted upon it. The best prevention of crime depends upon the increase of our knowledge of those circumstances that necessarily engender it. In England a speech like this would no doubt have raised a storm of theological indignation. In Germany the clergy is distinguished by its absence from scientific meetings. The separation of natural science and orthodoxy is complete, and no opposition was therefore offered to these remarks.

In the third and last general meeting two popular medical lectures were given, one by Dr. Ravoth, on nursing the sick; the other by Dr. Lender, on ozone (the latter gentleman having made some doubtful efforts of introducing infinitesimally small doses of ozone into medicine). Then Prof. von Pebal rose, and declaring the order of the day exhausted, thanked the members for their attendance at Gratz, and proposed a vote of thanks to the sovereign in whose realm they had assembled. This proposal having been cheerfully responded to, Dr. Stilling proposed and carried a cordial vote of thanks to the town of Gratz, and Dr. Rollet, who presided at the meeting, declared the assembly closed.

Of minor incidents may be mentioned the invitation of a society in Offenburg (Black Forest) to contribute for a monument to be erected to Oken in this his native town; and the distribution of several works written for the occasion, amongst others a guide to Gratz, and a commemorative volume published by the Medical Society of that town.

Reverting at last to a short review of the proper business of the Association, its sectional meetings, the reader will remark the absence at the German assembly of one of the most popular sections of the British Association, viz., that of engineering, while several other sections appear in the German programme that are omitted in the British society, notably those devoted to medicine. This review will form the subject of a second article. A. OPPENHEIM

THE GERMAN COMMISSION ON ARCTIC EXPLORATION

THE German Commission on Arctic Exploration, appointed by the Reichskanzler, and to which we have before referred, consists of Professors Dove and Neumayer, Doctors v. Richthofen and Siemens from Berlin, Prof. Karsten from Kiel, Prof. Grisebach from Gottingen, Prof. Zittel from Munich, Prof. Bruhns from Leipzig, Prof. Quenstedt from Tubingen, Director Rümker from Hamburg, Professors Schimper and Winnecke from Strassburg. The Commissioners have held meetings at Berlin from October 4 to 13; and the result of their deliberations—a long memoir on the value of the different branches of science—has been delivered to the Bundesrath for further consideration. The *résumé* of that report is contained in the following unanimously adopted conclusions:—

"1. The exploration of the Arctic regions is of great importance for all branches of science. The Commission recommends for such exploration the establishment of fixed observing stations. From the principal station, and supported by it, are to be made exploring expeditions by sea and by land.

"2. The Commission is of opinion that the region which should be explored by organised German Arctic explorers, is the great inlet to the higher Arctic regions situated between the eastern shore of Greenland and the western shore of Spitzbergen.

"Considering the results of the second German Arctic expedition, a principal station should be established on the eastern shore of Greenland, and, at least, *two* secondary stations, fitted out for *permanent* investigation of different scientific questions, at Jan Mayen and on the western shore of Spitzbergen. For certain scientific researches the principal station should establish temporary stations.

"3. It appears very desirable, and, so far as scientific preparations are concerned, possible, to commence these Arctic explorations in the year 1877.

"4. The Commission is convinced that an exploration of the Arctic regions, based on such principles, will furnish valuable results, even if limited to the region between Greenland and Spitzbergen; but it is also of opinion that an exhaustive solution of the problems to be solved can only be expected when the exploration is extended over the whole Arctic zone, and when other countries take their share in the undertaking.

"The Commission recommends, therefore, that the principles adopted for the German undertaking should be communicated to the Governments of the States which take interest in Arctic inquiry, in order to establish, if possible, a complete circle of observing stations in the Arctic zones."

NOTES

WE take the following from the *Times*:—

The award of the medals in the gift of the Royal Society for the present year, by the Council, is as follows:—The Copley Medal to Prof. A. W. Hofmann, F.R.S., for his numerous contributions to the science of chemistry, and especially for his researches on the derivatives of ammonia; a Royal medal to Mr. William Crookes, F.R.S., for his various chemical and physical researches, more especially for his discovery of thallium, his investigation of its compounds, and determination of its atomic weight, and for his discovery of the repulsion referable to radiation; a Royal medal to Dr. Thomas Oldham, F.R.S., for his long and important services in the science of geology, first as Professor of Geology, Trinity College, Dublin, and Director of the Geological Survey of Ireland, and chiefly for the great work which he has long conducted as Superintendent of the Geological Survey of India, in which so much progress has been made that in a few years it will be possible to produce a geological map of India comparable to the geological map of England executed by the late Mr. Greenough—also for the series of volumes of Geological Reports and Memoirs, including the "Palæontologia

Indica," published under his direction. It is hoped that Dr. Hofmann may be spared from Berlin for a few days so as to receive the medal in person. The medals will be presented at the anniversary meeting of the Society on the 30th inst.

The following are the names to be proposed for election as Council and officers of the Royal Society for the ensuing year at the anniversary meeting of the Society, to be held on the 30th inst., St. Andrew's Day:—President, Joseph Dalton Hooker, C.B. Treasurer, William Spottiswoode, M.A., LL.D. Secretaries, Prof. George Gabriel Stokes, M.A., D.C.L., LL.D., and Prof. Thomas Henry Huxley, LL.D. Foreign Secretary, Prof. Alexander William Williamson, Ph.D. Other members of the Council:—Prof. J. C. Adams, LL.D., Major-General John T. Boileau, Edward Viscount Cardwell, F.G.S., Warren De la Rue, D.C.L., Capt. Frederick J. O. Evans, R.N., C.B., Edward Frankland, D.C.L., Albert C. L. G. Günther, M.D., Prof. T. Wharton Jones, F.R.C.S., Joseph Norman Lockyer, F.R.A.S., the Rev. Robert Main, M.A., Prof. Daniel Oliver, F.L.S., Prof. Edmund A. Parkes, M.D., Right Hon. Lyon Playfair, C.B., LL.D., William Pole, C.E., the Rev. Bartholomew Price, M.A., Warrington W. Smyth, M.A.

At last Friday's lecture by Dr. Carpenter, in connection with the St. Thomas Charterhouse School Teachers' Science Association, Dr. Lyon Playfair presided. In proposing a vote of thanks to Dr. Carpenter, Dr. Playfair referred to the subject of compulsory education, which is gradually becoming universal in this country, but which, he said, would be pure tyrrany unless the education in our schools was increased and its quality raised. Quantity is all very good, but unless there is quality along with it, there is not much gained. "If it was to be said that children of thirteen or fourteen years of age were merely to receive the same education as children of eight years of age, compulsory education would be but tyranny. Therefore compulsory education involved higher education." Dr. Playfair expressed his gratification that the teachers composing the Association had banded themselves together in order to qualify themselves by attending such lectures as those of the Gilchrist fund and by other means, to undertake this higher education, which, we believe with Dr. Playfair, will be forced upon us even in elementary schools by the spread of compulsory education.

The conferring of the Freedom of the City of London on Sir George B. Airy, the Astronomer Royal, and late President of the Royal Society, which took place on Thursday last, is, we believe, the first instance in which that honour has been bestowed for scientific services unconnected with military or engineering science. In the civic speeches which accompanied the ceremony, great stress was laid on Sir G. B. Airy's services in connection with the Metric Standard.

In the Quarterly Return of Marriages, Births, and Deaths, just issued by the Registrar-General, we are glad to see that attention is pointedly drawn in the remarks to the annual epidemic of infantile diarrhœa, and the opinion expressed that it rests with the health officers of the diarrhœa-stricken towns to discover the nature of the sanitary shortcomings which lead to this waste of infant life. Perhaps equal stress might have been laid on a correct knowledge of the modes of nursing infants prevailing in the separate towns as on their merely sanitary conditions, as likely to lead to the true causes of the observed variations in the diarrhœa death-rate.

At the Meteorological Congress to be held under M. Le Verrier's presidency at Poitiers on the 19th, 20th, and 21st inst., as already stated in NATURE, steps will be taken to inaugurate, for the west of France overlooking the Bay of Biscay, a system of daily weather telegrams by the Observatory of Paris. Since this system of warnings is more specially designed to further the interests of agriculture, subscriptions are solicited from proprietors and others more specially interested in the success of the proposed scheme, particularly in view of the considerable expense which will be incurred in founding a sufficient number of stations with the necessary equipment of instruments. Weather warnings for agriculturists, if they are to be of practical utility, must do more than forecast high winds, they must also, and more particularly, aim at giving warning of the approach of frost, rain, snow, and thunder-storms; and this requires for its successful accomplishment more numerous stations and more frequent observations than are necessary in issuing warnings for the benefit of the shipping interest.

We have received the Transactions of the Michigan State Medical Society for 1875, containing among other matters a discussion by Professor Kedzie, the president, of the observations on ozone made by him during 1872-75; and a form for meteorological observations made thrice a day, adopted by the State Board of Health, Michigan, which appears to be well adapted for medico-meteorological purposes, except that the directions given for the position of the thermometer are vague as well as faulty to secure comparability among the observations.

At the last meeting of the General Council of the Yorkshire College of Science, under the presidency of Dr. Heaton, it was unanimously resolved to found a scholarship of the annual value of 25*l.*, to be called the Cavendish Scholarship, in recognition of the obligations conferred upon the college by the Duke of Devonshire and Lord F. C. Cavendish, M.P. From a statistical return presented by Mr. Henry H. Sales, secretary, it appears that 200 students are in attendance at the college, of whom more than forty are availing themselves of the day classes.

The Report of the Scotch Herring Fishery Board states that already certain facts have been discovered in the course of the experiments which have been instituted for the purpose of discovering how far the temperature of the sea and other meteorological conditions might be concerned in determining the migration of the herring. Arrangements were made during the season of 1874 for regular observations, and twenty of the fisheries were supplied, through the liberality of the Marquis of Tweeddale, with deep-sea thermometers for ascertaining the temperature of the sea at the times and places when fishing was going on. The records of these observations, taken in conjunction with the returns of the daily catch, and with particulars collected from other sources, were referred to Mr. Buchan, Secretary to the Meteorological Society, who analysed them. Although the returns are not sufficiently full to afford any accurate rule, owing to the lateness of the period before the sea-thermometers were ready to be sent to the fishermen, they prove that "during the periods when good or heavy catches were taken the barometer was, in the great majority of cases, high and steady, the winds light or moderate, and electrical phenomena wanting; and on the other hand, when catches were low, the observations often indicated a low barometer, strong winds, unsettled weather, and thunder and lightning." From the complete returns of the daily catch of the fish, and of the meteorological conditions, inclusive of the temperature of the sea, now obtained, it is anticipated that materials will be collected in three or four years from which most valuable conclusions will be arrived at.

A new edition of Dr. Lardner's "Handbook of Astronomy," revised and completed to 1875 by Mr. Edwin Dunkin, F.R.A.S., is nearly ready for publication by Messrs. Lockwood and Co. It will contain a large number of plates and woodcuts.

The *Daily Telegraph* announces that the letters from Mr. Stanley, committed to the charge of M. Linants de Bellefonds, have safely arrived, notwithstanding the assassination of Colonel Gordon's representative. They contain a full description of the south-eastern, eastern, and northern shores of Lake Nyanza.

The letters are said to contain valuable geographical data in illustration of the map already forwarded, including soundings of the Victoria Nyanza and an exploration of the White Nile above Ripon Falls.

In reference to the Reuter's telegram (vol. xii., p. 562) relative to the mission to Italy of Major Festing and Mr. Lockyer, we should state that the instruments which it was sought to collect for the forthcoming Government Exhibition of Scientific Instruments at South Kensington Museum are not instruments used in *recent astronomical* observations, but rather such as will be historically interesting as illustrating those sciences in the early development of which Italian philosophers such as Galileo, Toricelli, Volta, and Galvani took such a large share.

On Saturday evening, Captain Adams, of the whaler *Arctic*, arrived in Dundee from the Davies Straits fishing. From the condition of the wind and sea at Carey Island, Captain Adams believes that there must have been a vast extent of open water towards the north, and he is convinced that the Government ships must have reached a higher latitude than they possibly could have attained for many years past. Captain Adams has an intimate knowledge of the Polar regions, and has already made several valuable contributions to Arctic discoveries.

A series of Popular Scientific Lectures was commenced at the Town Hall, West Bromwich, on Tuesday week, when Prof. Williamson, F.R.S., lectured on "Coal and Coal Plants." The following remain to be given:—On Nov. 16, "The Age of Ice in Britain," by Rev. H. W. Crosskey, F.G.S. On Nov. 30, "Coal Gas," by F. Jones, F.R.S.E., F.C.S. On Dec. 14, "Nerve Cells and Nerve Fibres," by Prof. A. Gamgee, M.D., F.R.S. On Jan. 10, "The Mariner's Compass," by J. Hopkinson, D.Sc., M.A.

We have received the Report of the "Botanical Locality Record Club" for 1874. It forms a valuable addition to our topographical knowledge of British plants; and in the list of "New County Records," care seems to have been taken not to give those of the rarer plants so precisely that the publication will be likely to result in their extinction. A suggestion has been made to extend the area of the records to Cellular Cryptogams (Vascular Cryptogams being already included). This might probably be done with advantage as far as Mosses, Lichens, and Hepaticæ, and possibly also Fungi, are concerned; but with regard to Algæ, it is more doubtful whether much would be gained by a record of their geographical distribution.

MM. Reess and Will, of Erlangen, record in the *Botanische Zeitung* No. 44 for the current year, a series of observations on the carnivorous habits of *Dionæa* and *Drosera*. Made quite independently of Mr. Darwin's researches, and partly before their publication, they abundantly confirm his conclusions as to the power possessed by the sundew of absorbing and digesting nitrogenous substances. Similar experiments on other plants with glandular hairs produced, like Mr. Darwin's, negative results.

The *Argonaut* is to be doubled in size at the commencement of a new volume in January. A new feature will be a monthly report, suited for general readers, on the progress of science, specially prepared for the magazine "by professioual gentlemen of acknowledged standing in their respectives spheres of study."

It is gratifying to see that the value of experimental observation is coming to be more and more recognised in Medicine. We would draw attention, in reference to this, to a summary of an excellent address on the subject, by Dr. McKendrick, of Edinburgh, which appears in last Saturday's *British Medical Journal*.

Prof. W. R. M'Nab reprints from the *Quarterly Journal of Microscopical Science* his translation of Brefeld's most important researches on the life-history of one of the common blue moulds, *Penicillium glaucum*. A very close research succeeded in detecting the hitherto unknown sexual mode of reproduction of this fungus. Brefeld terms the second generation a sclerotium or sporocarp, from which are developed—as the result of the union of the true sexual organs, the carpogonium and antheridium—asci and ascospores, the formation of which shows that *Penicillium* must be placed in the group of Ascomycetes; and he considers that, from the striking resemblance of the minute structure of the sclerotia to those of the truffle, a position must be assigned it close to the Tuberaceæ.

The second part of Bentley and Trimen's "Medicinal Plants" fully maintains the character of the first. It contains seven plates: *Theobroma Cacao* (the cocoa-plant), *Rhamnus catharticus*, *Prunus Amygdalus* (the almond), *Pyrus Cydonia* (the quince), *Lobelia inflata*, *Gaultheria procumbens*, and *Cinnamomum zeylanicum* (the cinnamon). The letter-press is amply descriptive of the various species and their officinal preparations. The work will be completed in about forty parts.

MM. Wiegandt, Hempel, and Parey, of Berlin, are publishing a large number of wall-maps or diagrams for instruction in natural history, with especial reference to agriculture. Five series have been issued up to the present time; the first relating to the breeding of stock; the second to the production of wool; the third to the minute structure of plants; the fourth to the cultivation of root and other crops; and the fifth to physical geography.

Mr. J. J. Harris Teall, B.A., First Class in the Natural Sciences Tripos 1872 and Sedgwick Prizeman 1873, has been elected a Fellow of St. John's College, Cambridge. Mr. Teall is at present one of the lecturers engaged on behalf of the University in the larger towns.

The unfortunate explosion of the *Magenta* at Toulouse has involved a loss of some consequence to science. Eighteen Phœnician inscriptions, recently discovered and on their way to the Louvre Museum, were on board the ill-fated steamer. Great efforts will be made to raise the hull, and the inscriptions may possibly be recovered by divers.

The Crystal Palace Company's School of Practical Engineering is to be further developed this season by the addition of a Colonial Section. This section is designed particularly for gentlemen who intend to proceed to the colonies or abroad, as explorers or settlers. The object proposed is to afford them so much practical knowledge of scientific and mechanical work and expedients as shall enable them best to utilise the means with which they may have to deal, especially when entirely dependent on their own resources. The Colonial Section will be opened on January 5, 1876.

A retriever dog, whose owner was working in the garden of the Bath Institution, lately killed a favourite cat, a frequenter of the same grounds. Having committed this unprovoked murder, the dog deliberately took the cat in his mouth, carried it some distance, dug a deep hole behind some bushes, and after depositing the cat therein, carefully replaced the earth, and had he not been observed there would have been no evidence of the crime. Shortly after, the dog lost his life by poison, probably a penalty for the offence.

In the neighbourhood of Bath a gentleman possesses a pair of carriage horses, one of which evinces more than ordinary intelligence when his own ends have to be served. If the horse hears, even in the distance, the very first movement of a mowing-machine, he connects the sound with fresh grass, and at once taps with his hoof at the boarding of the stall to summon the

coachman for a supply. At first this is done gently, but if time passes he imperatively demands attention, or it is doubtful if the stable would contain him. The coachman lives adjoining the stable, and, much to his discomfort, the horse sometimes has imaginary wants during the night, and repeats the same process ; and at whatever hour this occurs, the coachman is under the necessity of getting up to attend to him.

On the 23rd inst. there will be an election at Balliol College, Oxford, to a scholarship on the foundation of Miss Hannah Brakenbury, "for the encouragement of the study of Natural Science," worth 80*l.* a year, tenable during residence of four years; open to all such candidates as shall not exceed eight terms from matriculation. Candidates are requested to communicate their intention to the Master of Balliol by letter, on or before Tuesday, the 16th inst., enclosing testimonials.

The formal opening of the Zoological Garden of Cincinnati took place on the 18th of September. It contains sixty-six acres, and is very well arranged for its purposes.

The additions to the Zoological Society's Gardens during the past week include two Macaque Monkeys (*Macacus cynomolgus*) from India, presented by Mrs. Tipping ; an Egyptian Goose (*Chenalopex ægyptiaca*) from Africa, presented by Dr. E. Swain ; a Ring-necked Parrakeet (*Palæornis torquata*) from India, presented by Miss Thirlwall ; a White-fronted Guan (*Penelope jacucaca*), a White Eye-browed Guan (*Penelope superciliaris*) from S.E. Brazil, a Vulpine Phalanger (*Phalangista vulpina*) from Australia, a Blue and Yellow Maccaw (*Ara ararauna*) from S. America, two Jambu Fruit Pigeons (*Ptilonopus jambu*) from the Indian Archipelago, deposited ; two Upland Geese (*Chloëphaga magellanica*) from the Falkland Islands, received in exchange.

*OBSERVATIONS ON BEES, WASPS, AND ANTS**

THIS is a continuation of my previous papers on the same subject. In them I recorded various experiments tending to show that in many cases Ants and Bees which have found a store of food or of larvæ certainly do not communicate the information to their friends. This unexpected observation was received with so much surprise, and indeed was so unexpected to myself, that I determined to repeat the experiments : which I have now done, with, however, the same result. To take one as an illustration : I placed an *F. flava* (the small red ant) to a heap of larvæ, which, as is well known, are fleshy legless grubs incapable of motion. I placed them about two feet from the entrance to her nest. I then watched her from eleven in the morning till after seven in the evening, during which time she made eighty-six journeys from the nest to the heap of larvæ, carrying one off each time ; but although she had so much work to do, and though the precious larvæ were lying for so long exposed to so many dangers and to the weather, she brought no other ant to assist her in carrying them off. One of the ants I observed in this way carried off one by one no less than 187 larvæ in a day. In other instances, on the contrary, the opposite result occurred. I was for some time uncertain, in the latter cases, whether the ants purposely brought friends to their assistance, or whether, as the ants are sociable insects, it merely happened that the one accompanied the other, as it were, by accident. To test this question, I took two ants, and placed them under similar circumstances, the one to a heap of larvæ, the other to a group of two or three, always, however, putting one in place of any that was carried off; and it was quite clear that the ants which were placed to the large group of larvæ brought far more friends to their assistance than those which had apparently only two or three larvæ to move. Of thirty ants which were observed, those placed to a large number of larvæ brought 250 friends, while those placed to two or three larvæ under similar circumstances only brought eighty.

One account, much relied on as showing the intelligence of ants, has been the following observation made by M. Lund in Brazil. Passing one day under a tree which stood almost by itself, he was surprised to hear the leaves falling like rain. On examining the cause of this, he found that a number of ants had climbed the tree, and were cutting off the leaves, which were then carried away by companions waiting for them below. Of course it might be said that the leaves which dropped fell by accident ; in which case they would naturally be carried off by the ants below. It occurred to me, however, that this was an observation which might easily be repeated. I placed therefore a number of larvæ on a slip of glass, which I suspended by a tape, so that it hung one-third of an inch from the surface of one of my artificial nests ; isolating it, however, in such a manner that for an ant to walk to the nest she would be obliged to go thirteen feet round. I then placed some black ants (*F. nigra*) on the glass with the larvæ. Each of them took a larva in the usual way, and then endeavoured to go by the quickest road home. They leaned over the glass and made every effort to reach down, but of course in vain, though the distance was so small that they could all but touch the nest with their antennæ, and even, in one or two cases, succeeded in getting down by stepping on to the back of an ant below. Those, however, which did not meet with any such assistance, gradually, though at first requiring some help from me, found their way round to the nest, and after a short time there was quite a string of ants passing to and fro from the nest to the larvæ, although it would have been so easy for them to throw the larvæ over the edge of the glass, or to go straight home, if they would have faced a drop of, say, one-tenth of an inch.

Moreover, I placed some fine mould within half an inch of the glass, so that it would have been easy for the ants, by literally one minute's labour, to have constructed for themselves a stepping stone up to the glass ; yet they did not adopt any of these expedients, but for hours together, and by hundreds, continued to make the long journey round. I confess this experiment, which I repeated on several occasions, surprised me very much.

As my previous experiments, which showed that bees did not by any means in all cases bring their friends to share stores of food which they had discovered, have been much questioned by bee-keepers, I have repeated them again.

No doubt, if honey is put in an exposed place, so that it is found by one bee, it is most natural that others should also find their way to it ; but this does not, according to my experience, happen if the honey is concealed. For instance, I put a bee to some honey in a flowerpot placed on its side, and so arranged that the bee had only a small orifice through which to enter. Under these circumstances, from a quarter to seven in the morning till a quarter past seven in the evening, she made fifty-nine journeys, and during the whole of this time only one other bee found her way to the honey.

I found that bees soon accustomed themselves to look for honey on papers of particular colours. For instance, on Sept. 13 I placed a bee to some honey on a slip of glass on green paper, and after she had made twelve journeys to and from the hive I put red paper where the green had been, and placed another drop of honey on a green paper, at a distance of about a foot. The bee returned, however, to the honey on the green paper. I then gently moved the green paper, with the bee on it, back to the old place. When the bee had gone, I replaced the green paper by a yellow one, and put the green again a foot off. After the usual interval she returned again to the green. I repeated the same proceeding, but with orange paper instead of green. She returned again to the green. I now did the same with white paper : she returned again to the green. Again I tried her with blue : she again came to the green. I then reversed the position of the blue and green papers, but still she returned to the green. I repeated this experiment with other bees, and with the same result, though it seemed to me that in some cases they did not distinguish so clearly between green and blue as between green and other colours. In other respects they seemed to adhere equally closely to any colour to which they were made accustomed.

As regards wasps, my experiments fully confirm those previously made, and justify everything I have said with reference to their great industry. Indeed, they begin to work earlier in the morning and cease later in the evening than bees, continuing all day with the utmost assiduity. Thus, a wasp which I watched on the 10th of September, worked from seven in the morning until seven in the evening without a moment's intermission, during which time she made no less than ninety-four visits to the honey. As is the case with bees, if a wasp is put to exposed honey, others soon come. To determine this, if pos-

* A paper read by Sir John Lubbock, Bart., M.P., D.C.L., F.R.S., at the Linnean Society, Nov. 4. Communicated by the author.

sible, I trained a wasp to come to some honey which I placed in a box communicating with the outside by an india-rubber tube six inches in length and one-third of an inch in diameter. She came to this honey continuously for three days, during which time no other wasp found the honey. As regards colour, I satisfied myself, by experiments like those made with bees, that they are capable of seeing colour, though they appear to be less influenced by it than are bees.

OUR BOTANICAL COLUMN

IRISH HEPATICÆ.—S. O. Lindberg has just published a quarto memoir on the "Hepaticæ in Hibernia mense Julii 1873 lectæ." This memoir is a reprint from the tenth volume of the "Acta Societatis Scientiarum Fennicæ," and contains a list of eighty-nine species of Hepaticæ collected during a month's visit to Ireland. The author had the benefit of the great geographical knowledge of Dr. Moore—the author with A. G. More of the "Cybele Hibernica"—to enable him to visit, without delay, the most productive portions of Ireland; otherwise it may be doubted if his collections would have been so rich. Many of the species described are very rare; some of them are new. The synonymy of the species is worked out in a manner worthy of the greatest praise. Many of the smaller forms among Lejeunea and other genera are described from fresh specimens or from those preserved in alcohol. The collections were chiefly made in Killarney. Of the new species we may mention *Lejeunea patens*, *L. Moorei*, *Zygodon aristatus*. In an appendix we find a list of the genera of European Hepaticæ classified as follows:—

1. Marchantiaceæ.
2. Jungermaniaceæ.
3. Anthoceroteæ.

The group of Marchantiaceæ is divided into *A. Schizocarpæ* and *B. Cleistocarpæ* (this latter includes such genera as Tessellina and Riccia); that of Jungermaniaceæ into the same two sub-sections; and these are again much sub-divided.

The existence in Ireland of so large a number of interesting forms, of which so very much yet remains to be known as to their life-history, ought surely to act as a stimulant to the rising school of Irish botanists.

MARINE ALGÆ OF THE UNITED STATES.—Although nearly twenty years have elapsed since the third part of Harvey's "Nereis Boreali-Americana" was sent to the press, yet the contributions to a knowledge of the North American Algæ have been but few. W. G. Farlow, one of Prof. Asa Gray's assistants, ascribes this to the fact that but few American botanists reside on the western coast of America, where novelties might be expected; and he publishes a most welcome list of the marine species of the United States *proper*, not including Alaska, but in part enumerating those of Vancouver's Island. Those added since the publication of Harvey's "Nereis" are denoted by a star. The number of species enumerated is 430, a number that doubtless will be increased when the Algæ are investigated as recent forms either living or preserved in fluid, and not, as is now frequently the case, only examined when in a state of what is but little better than that of stains on white paper. Mr. Farlow's list will be found in vol. x. 2nd ser. of the Proceedings of the American Academy of Arts and Sciences.

COFFEE IN DOMINICA.—A good deal of attention has been directed of late to the island of Dominica as a coffee-producing country, a fact briefly referred to in NATURE, vol. xii. p. 173. At one time coffee was one of the staple products of the island, and was grown not only in large quantities, but also of excellent quality. At the present time little or none is exported to Europe, but the island still grows sufficient to supply its own demands, and we believe sends a little to the neighbouring islands. This falling off in the cultivation of the coffee-plant, in a soil and climate which experience showed was eminently suited to it in every respect, was due to the extensive destruction of the plants by what was then known as the coffee blight. This was soon found to be of insect origin, but no active or energetic measures were taken to rid the island of the pest, which continued its ravages, destroying many plantations, and even driving planters away in great numbers. Nothing seems to have been known regarding the insect itself until within the past few weeks, when specimens in their various stages, together with the injured leaves, have been received at the Kew Museum. Upon submitting these specimens to an entomologist, they were at once identified as the White Coffee-leaf Miner (*Cemiostoma coffeellum*, Mann.), an insect exceedingly destructive to the coffee-plants in Brazil, Rio Janeiro, Martinique, &c. The crops of coffee in Brazil are said to be lessened one-fifth in consequence of the ravages of this insect.

It is remarkable that little seems to have been known in Dominica about the classification or habits of the insect, though it made its first appearance there in 1833, some forty-two years back, and it seems to have been known in Brazil only within the last twenty or twenty-three years. An elaborate description of the insect and its ravages will be found in the *American Naturalist*, vol. vi. pp. 332, 596; 1872.

SCIENTIFIC SERIALS

Annual Report and Proceedings of the Belfast Naturalists' Field Club, 1873, 74.—This Report was written before the meeting of the British Association in Belfast last year, so that its issue must have been very much delayed. The Society, according to the Report, as to financial condition and number of members, is in a thoroughly satisfactory condition. The Society, as a Field Club, makes excursions during summer; an account of those for 1873 is contained in this part of the Proceedings. The papers read during the winter session are all interesting; we have space only for the titles:—"On the British Association, its aims and objects," by Mr. W. Gray; "On Progressive Development," by Mr. G. Langtry; "On the Surnames of the Inhabitants of the County Antrim, and their indications," by the Rev. E. M'Clure; "On Flints, and the Foraminifera, Entomostraca, &c., contained in them," by Mr. Joseph Wright, F.G.S.; "Irish Cranoges and their contents," by Mr. F. Wakeman; "Notes on the Aurora Borealis, taken in Belfast in the years 1870, 71, with suggestions as to its source and that of the earth's magnetism and magnetic currents," by Dr. T. H. Keown, R.N. The Appendix contains two valuable lists; first, of the Mosses of the North-east of Ireland, by Mr. S. A. Stewart; and second, of the Cretaceous Microzoa of the North of Ireland, by Mr. Joseph Wright, F.G.S., the latter illustrated by a large number of figures.

Poggendorff's Annalen der Physik und Chemie, No. 9, 1875.—This number commences with a long paper, in which M. Wilhelm Weber investigates mathematically the motion of electricity in bodies of molecular constitution. Among the points treated are, objections against the fundamental law of electric action; identity of the moveable parts (in all bodies) whose movement is heat, magnetism, or galvanism; identity of *vis viva* of the electromotive force in the current with the heat produced by the current in the conductor; movement and distribution of electricity in conductors; and Kohlrausch's theory of thermo-electricity.—In an article on formation of sound, Prof. Stern inquires why tuning forks without resonant supports give such a very weak sound. It cannot be due, as many physicists suppose, to their less surface of contact with the air, else high-pitched small forks could not sound louder than low and large ones, nor could overtones sound louder than ground tones when *e.g.* a large fork is struck with a hard body. Having shown reason for thinking that the amplitude of vibration and number of vibrations in unit of time have no direct influence on the strength of the sound, Prof. Stern groups together a number of interesting phenomena bearing on the subject: the difference in rate of decrease of sound, in high and low forks, on withdrawal from the ear; a like difference with regard to transverse vibrations and those produced longitudinally; the interference-effects where resonance-cases act on each other; the effects of bringing a resonator near an organ-pipe, &c. The paper is not yet concluded.—The action of the Holtz machine still requires some elucidation, and in a paper to the Berlin Academy (here reproduced) M. Poggendorff furnishes "further facts towards an adequate theory of electric machines of the second kind" (with two moveable discs). One of these facts is as follows:—The two discs turning in opposite directions, stop (say) the front one by holding it (the screw having previously been loosened); then, when the back disc is rotated, a current is obtained as before. Now turn the front disc round through 360°, and rotate the back disc as before. If this turning be done in the direction of the front disc's former rotation, the current in the back disc is unaltered; but if in the opposite direction, it is reversed. A turning of 180° or even of 90° has the same effect. These and similar facts, indicating an influence of *direction* (rather than extent) of dis-

placement, on the direction of the current, the author is unable to account for satisfactorily; they cannot, he thinks, be due to inductive action.—Some researches by Dr. Neesen on attraction and repulsion by rays of light and heat are noticed in our "Science in Germany."—M. Soret describes the diffraction phenomena obtained with circular gratings, consisting of opaque discs with a series of openings in the form of concentric rings; and a paper of "Optical Notes," by Dr. Wolcott Gibbs, of the American Academy, treats of a new optical constant, and a method of measuring indices of refraction without employment of graduated instruments.—M. Fuchs shows how the electrometer may be used for determining intensity of current, polarisation, and resistance; and M. Mach describes a polarisation apparatus with rotating analyser.

Bulletin de l'Academie Impériale des Sciences de St. Petersbourg. (t. xix. Nos. 4 and 5; t. xx. Nos. 1 and 2).—From these publications we notice the following more important papers:—On the double star Σ 634 = Camelopardali 19, Hev., by Dr. O. Struve.—On the salts of parabanic acid, by N. Mentchutkine; the author considers the potash, soda, ammonia, and silver salts of this acid.—On oxalurate of potash and on the determination of potassium in the salts of the acids of the uric group, by the same.—On the velocity of irritation in the spinal marrow, by E. Cyon.—Researches on blood, by Heinr. Struve.—On carbon tetraiodide, by M. G. Gustavson.—On a simple evaporimeter, alike useful in winter or summer, by H. Wild.—Continued observations of the companion of Procyon, by O. Struve.—On dimethylisobutylcarbinol and the new heptylene obtained by means of this alcohol, by M. D. Pawlow.—On iodide of ethylidene, by M. G. Gustavson.—On the chemical structure of pinacoline, by M. A. Boutlerow.—Preliminary note on the elasticity of rarefied air, by M. D. Mendeleeff and M. Kirpitschoff.—Diagnoses plantarum novarum Japoniæ et Mandshuriæ, by C. J. Maximowicz.—Report on a new iron meteorite from the shores of the Angara river, in the government of Jenisseisk, by M. A. Goebel.—Observations of the planets at the Academical Observatory of St. Petersburg; determination of the longitude of the ascending node in the orbit of Mars, by A. Savitsch.—Results of measurements made on crystals of arragonite, copper, pyrites, and skorodite, by N. von Kokscharow.—On the doubts recently raised on the cosmical origin of the Pallas iron, and a refutation of the same, by M. A. Goebel.—Hydrological researches, by Prof. C. Schmidt, of Dorpat. The author treats of the Caspian Sea, the Sea of Aral, the Dwina, and the White Sea.—On a method to obtain a uniform exposure in photographing the sun, by Dr. B. Hasselberg.—On the existence of a resisting medium in celestial space, by Dr. E. von Asten.—Researches on the theory of the determination of orbits, by Fr. W. Berg.—Barycentric theorem, which gives a means to express the duration of any movement of a point, by relation of two straight lines; by J. Somoff.—A note on perowskite crystals, by N. von Kokscharow; the author describes the determination of perowskite forms by approximate measurements made with the ordinary reflexion goniometer of Wollaston, the nature of the perowskite crystals from the Ural Mountains, and the angles measured.—Results of exact measurements of sulphur crystals, by the same. Analysis of the observations made in the Caucasus on terrestial refraction, by M. Sawitch.—A note on mechanisms which retard reflex actions, by J. Setschenow.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, Nov. 4.—Dr. G. J. Allman, F.R.S., president, in the chair.—The following papers were read:—Observations on Bees, Wasps, and Ants, Part III., by Sir John Lubbock, Bart., F.R.S. An abstract of this paper appears in another column.—On the rate of growth of the female flower-stalk of *Vallisneria spiralis*, by A. W. Bennett, F.L.S. The peduncle of the female flower of this plant is remarkable for the rapidity of its growth, attaining a length of from three to four feet, and increasing, at its period of greatest energy, at the rate of half an inch per hour. The observations were chiefly directed to determine which portion of the peduncle displayed the greatest part of this energy; and this was found to lie in a portion at but a short distance below the flower-bud; a marked zone of two inches increasing ultimately relatively to the remainder of the flower-stalk about in the proportion of three to two. This displays a greater analogy to what has been hitherto observed in the case of roots than in that of aërial stems. The coiling up of the peduncle so as to bring the flower beneath the surface does not take place when the flower has not been impregnated.—On plants collected by Lieut. Cameron about Lake Tanganyika, by Prof. Oliver, F.R.S.—On a collection of North Celebes plants made by M. Riedel, by Prof. Oliver, F.R.S.

Chemical Society, Nov. 4.—Prof. Abel, F.R.S., president, in the chair.—First paper, On the decomposition of stearic acid by distillation under pressure, by Mr. G. Johnston.—Dr. C. R. A. Wright read a paper, by himself and Mr. G. A. Beckett, On Isomeric Terpenes and their Derivatives, being Part V. of their researches on this subject; also one On the Alkaloids contained in the Aconites, Part I.; after which Mr. F. J. M. Page gave an account of a simple form of gas regulator for maintaining a constant temperature in air-baths, water-baths, incubators, &c.—Communications were also read from Mr. R. W. E. M'Ivor, on the fluorides of arsenic, phosphorus, and iodine; and on the iodide of antimony.—The last paper, On Tolylphenyl, a new hydrocarbon, was by Mr. T. Carnelly.

Zoological Society, Nov. 2.—Dr. E. Hamilton, V.P., in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the months of June, July, August, and September, 1875.—A letter was read from Signor L. M. D'Albertis, giving some account of several excursions he had made into Southern New Guinea from his present quarters in Yule Island.—A note was read from Mr. Walter J. Hoffman, describing a horn of an American Prong-horn (*Antilocapra americana*), with a double prong.—A letter was read from Capt. J. Moresby, R.N., giving the exact locality of the young *Casuarius uni-appendiculatus*, presented by him to the Society in August 1874.—A communication was read from Dr. P. von Bleeker, containing a description of a rare Central-Asiatic fish (*Elopichthys dahuricus*.—A communication was read from Mr. Edgar A. Smith, containing the description of a new species of *Carinifex* from California, which he proposed to name *Carinifex ponsonbii*.—A second communication from Mr. Smith contained remarks on the genus *Alaba*, with the description of a new species.—A communication was read from Mr. W. T. Blanford correcting certain errors in the figures of *Herpestes ferrugineus* and *Ovis polii*, in the Society's Proceedings.—Mr. P. L. Sclater, F.R.S., and Mr. O. Salvin, F.R.S., read a paper giving the descriptions of two birds from Medellin, State of Antioquia, U.S.C., which appeared to be new to science, and were named *Catharus phaopleurus* and *Automolus holostictus*.—Mr. A. H. Garrod read a report on the causes of death of the Indian elephant which died in the Gardens on July 7, 1875.—A communication was read from the Rev. S. J. Whitmee, of Samoa, on the habits of the fishes of the genus *Antennarius*.—A communication was read from Mr. G. E. Dobson, containing a monograph of the bats of the genus *Taphozous*, Geoffr.—A communication was read from Dr. Otto Finsch, containing notes on the pigeons of the genus *Chrysæna*.—A communication was read from Dr. J. S. Bowerbank, F.R.S., being the fifth part of his monograph of the siliceo-fibrous sponges.

Royal Microscopical Society, Nov. 3.—Mr. H. C. Sorby, F.R.S., president, in the chair.—A very interesting paper was read by the President, On a new method of measuring bands in spectra. It was first explained that by means of the ordinary quartz absorption band plate, the exact position of a spectrum line not coinciding with either of the absorption bands, could not be accurately determined; and the necessity for so doing having been shown, the author described and figured his new contrivance designed for the purpose. It consisted of a piece of quartz about 1½ inches thick, and cut with parallel surfaces exactly at right-angles to the principal axis of the crystal, along the line of which there was no polarisation. This gave a series of seven dark bands when placed between two Nicol prisms and viewed through the spectroscope. By rotating the upper prism the position of the first band could readily be made to coincide with any given fixed line as D, and by the rotation of the lower prism the series of bands could be caused to traverse the entire spectrum, each half rotation moving them forward the precise amount of the distance existing between them. A graduated scale marked upon a circle attached to the lower prism enabled the position of the bands to be compared with great accuracy with that which they originally occupied, and of course also with that of any fixed lines shown in the comparison spectrum. A paper by Dr. J. J. Woodward (U.S.A.), on *Frustulia Saxonica*, was read by the Secretary.

CAMBRIDGE

Philosophical Society, Oct. 25.—Mr. J. W. L. Glaisher read a paper on Herwart ab Hohenburg's Tabulæ arithmeticæ προσθαφαιρεσεως universales, Munich, 1610. The book is a very large and thick folio, and contains a multiplication table up to 1000 × 1000, the thousand multiples of any one number being given on the same page. There is an introduction of seven pages, in which the use of the tables in multiplying numbers containing more than three figures, and in the solution of spherical triangles, is explained. Very little information with regard to the work is to be obtained from the mathematical bibliographers and historians, Heilbronner, Kästner, Scheibel, Marhard, Rogg, Montucla, Lalande, &c. De Morgan writes: "Herwart passes for the author, but nothing indicates more than that the manuscript was found in his collection. The book is excessively rare; a copy sold by auction a few years ago was the only one we ever saw." While preparing the report of the British Association Committee on Mathematical Tables, Mr. Glaisher had endeavoured without success to obtain some further information about this great multiplication table, which has never been exceeded, and which is only equalled by Crelle's Rechentafeln, which first appeared in 1820, and is now in general use. But recently he had found a correspondence of six letters between Herwart and Kepler, which are printed in vol. iv. (1863) of Frisch's complete edition of Kepler's works, and which throw light upon the table in question. In the first, dated September 13, 1608, Herwart mentions that he has been in the habit of using a special praxis for avoiding the labour of multiplication, and which his friends have recommended him to print. He adds that without it he should long ago have had to give up all mathematics which involved calculation, on account of his many occupations and because he was not a good computer. He encloses a page as a specimen. Kepler replies that he thinks the table will be useful, and he urges that its uses in the solution of spherical triangles should be noticed, pointing out its superiority in point of clearness to the "προσθαφαιρεσις Vitichiana," which is too complicated to be retained in the memory. Herwart replies that he had already thought of its application in prosthaphæresis; he suggests a title for the book, and asks for Kepler's opinion; and in the last letter of the correspondence Kepler proposes the title "Σειραχθεια sive Novæ Tabulæ, quibus Arithmetici debitis inextricabilibus multiplicandi et dividendi liberantur, ingenio, tempori, viribusque ratiocinantis consulitur." It is thus proved that the table was printed from a manuscript which Herwart used himself, and which very likely he had had made. As for the word prosthaphæresis, it is well known that the prosthaphæresis of the orbit is the angle subtended at the planet by the eccentricity, and De Morgan explained the use of the word on the title-page thus: "Prosthaphæresis is a word compounded of prosthesis and aphæresis, and means addition and subtraction. Astronomical corrections sometimes additive and sometimes subtractive were called prosthaphæreses. The constant necessity for multiplication in forming proportional parts for the corrections gave rise to this table, which had the name of its application on its title-page." But the prosthaphæresis referred to seems most likely a method of solving spherical triangles in which the product of two sines or of a sine and cosine is avoided by the use of formulæ such as $\sin a \sin b = \frac{1}{2}\{\cos(a-b) - \cos(a+b)\}$, and such a method is associated with the name of Wittich. This explains all Kepler's allusions, and why Herwart employed the word on his title-page, as he proposed to avoid the necessity of the transformation by rendering easy the operation of the simple multiplication. A copy of Herwart's work borrowed, through the kindness of Prof. Henrici, from the Graves Library at University College, London, was exhibited to the meeting.

MANCHESTER

Scientific Students' Association, Oct. 20.—Mr. Mark Stirrup gave a short account of a visit to the celebrated Chesil Bank, on the coast of Dorset, and exhibited some specimens of the pebbles therefrom. The source whence these pebbles were derived and their mode of accumulation, as explained by many writers on the subject, were referred to. All these explanations have failed to account satisfactorily for a deposit of such vast magnitude, and there is no doubt that the views recently enunciated by Prof. Prestwich, F.R.S. (see NATURE, vol. xi., p. 299), go far to clear up the difficulty.

PARIS

Academy of Sciences, Nov. 2.—M. Frémy in the chair. The following papers were read:—Determination of the class of envelope-curves which present themselves in questions of equality of size of two segments made on tangents of geometric curves, by M. Chasles.—On the steam carriage of M. Bollée, of Mans, by M. Tresca.—Fourteenth note on the electric conductivity of mediocre conductors, by M. Du Moncel. These experiments were with various metallic filings and the powder of metallic minerals, graphite, and retort charcoal, which were compressed into prisms between mica-plates. When heated, their conductivity at first diminishes somewhat, but it then increases very rapidly. When the heating ceases, it diminishes again, and after some time the intensity of the current becomes much less than it was at first. Thermo-electrical and chemical effects are also described.—On the useful effect of steam injectors (concluded), by M. Ledieu.—On the laws which govern reactions with direct addition (continued), by M. Markovnikoff.—On the unipolar electric excitation of nerves: comparison of the activity of the two poles during the passage of battery currents, by M. Chauveau. The subject was placed half in salt water, and a fine electrode applied to a point selected on the skin of the emergent portion; the other electrode was held in the liquid. Or the two electrodes were placed on two nerves sufficiently apart. M. Chauveau finds that for every healthy subject there is a certain moderate intensity of current, with which the contractions produced by the positive and negative excitation are equal in extent and duration; *below* this intensity the negative pole has the greater action; *above* it, the positive.—On the general arrangement of the nervous system in stylommatophorous pulmonate gasteropod molluscs, by M. Fischer.—Results obtained by means of sulphocarbonate of potassium on vines attacked by Phylloxera at Mezel. M. Dumas, summing up the testimony on this point, said the sulphocarbonates had everywhere proved effective (where used) in destroying the insect, and they rather improved than injured the quality of the vines.—On the method of Cauchy for the integration of an equation with partial derivatives of the first order, by M. Mansion.—M. Sainte-Claire Deville gave an extract from a letter by M. Fouqué, describing observations of volcanic phenomena in the island of Santorin.—The Perpetual Secretary called attention to a work of "Researches on the Combustion of Coal," by MM. Scheurer, Kestner, and Mennier-Dollfus; also to a memoir by MM. Marion and Borretzky, on the Annelids of the Bay of Marseilles. He further announced the publication, by M. Dummler, of a *résumé* of works of the Berlin Academy of Sciences from 1822 to 1872.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—Air and its Relations to Life: W. Noel Hartley, F.C.S. (Longmans).—The Princes of India: Sir E. Sullivan, Bart. (Stanford).—Inaugural Address of the West London Scientific Association and Field Club. Session 1875-6: Rev. G. Henslow, M.A., F.L.S.—Notes of Travel in South Africa: Chas. J. Anderson. Edited by J. Lloyd (Hurst and Blackett).—The Revised Theory of Light: W. Cave Thomas (Smith, Elder, and Co.)

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