THURSDAY, OCTOBER 31, 1895.

THE CENTENARY OF THE INSTITUTE OF FRANCE.

FROM the brief telegraphic reports published in some of the English newspapers, readers in this country may have observed that the hundredth anniversary of the foundation of the Institut de France was celebrated last week in Paris. These reports, however, convey but a feeble impression of the real character of the celebration. The Institute is an establishment of which Frenchmen of all classes and of every shade of political opinion are justly proud. They look on it as a living embodiment of the culture and intellectual power of France. It stands above and beyond politics. Forms of Government may come and go; kings, emperors, and republics may arise, flourish, and disappear. But the Institute remains unshaken, quietly pursuing its career, and sustaining with marvellous success the intellectual glory of the nation. No wonder, then, that amid the turmoil of parties, the strifes of Parliament, and the endless changes of Ministries, many men turn to the Institute as the only stable institution, which royalists, republicans, socialists, and anarchists seem to be alike agreed in respecting.

That Republicans especially should show an interest in this institution was natural. It was founded a hundred years ago during the first Republic. The idea of restoring the old Academies and combining them into one central institution was carried out by the Republican Convention, with the openly professed intention of promoting the literary, artistic and scientific labours which should best contribute to the general benefit and glory of the Republic. After all the transformations of the last hundred years, a Republican form of government is once more in power. It was only fitting, therefore, that the State, by its highest officials, should manifest its interest in this, the oldest and most illustrious child of the Revolution, by taking an active and prominent part in the Centenary of its existence.

An Englishman privileged to be present at the celebration could not fail to be struck by various features in it that stood out in marked contrast to anything that would have been possible in his own country. In the first place, of course, the Institute itself is unique, in the wide range of subjects with which it is concerned. We have many admirable learned societies at home, from the Royal Society downwards, and so far as scientific progress is concerned, they are possibly of at least as great service as any Academy of Sciences in the world. We have likewise our Royal Academy of the fine arts, which may, it is to be hoped, hold its own against any foreign competitor. We have, however, nothing that corresponds to the French Institute, and the question has often been discussed whether the creation of such an Institute amongst us would be possible or desirable. But what especially strikes a stranger at such a gathering as that of last week in Paris, is the catholicity of view which led to the union under one organisation of so vast a range of human culture and faculty. Prose-writers, poets, dramatists, antiquaries, mathematicians, physicists, astronomers, geographers, engineers, chemists, mineralogists, geologists, botanists, anatomists, zoologists, physicians, surgeons, painters, sculptors, architects, engravers, musicians, writers on philosophy, morals, law, political economy, and history—all meet as in a common home under the dome of the Institute on the banks of the Seine. Each of the five Academies has its own sphere of activity and its own independent organisation. But they confer mutual strength and dignity on each other by the common tie that binds them together as the Institute of France. And one cannot help feeling that in a country liable to such political vicissitudes as France has gone through during the last hundred years, it has been of unspeakably great advantage to the stability and progress of all the arts and sciences which elevate a people, that this solidarity of intellectual effort should have been established at the beginning of the long succession of political troubles.

Another feature which impressed a native of this country was the direct, hearty and effective part which the highest functionaries in the State played in the chief events of the celebration. The President of the Republic himself received the foreign members and correspondants one morning at the Elysée, shaking hands with each, and stopping every now and then to say some few appropriate words to one whose name or whose work was known to him. The whole ceremony was as simple and natural as it was pleasant. M. Faure likewise presided at the opening meeting at the Sorbonne; and on Friday evening he held a brilliant reception, to which all the members and correspondants of the Institute were invited, with their wives, together with a large assemblage of other guests, including the Ministry, the Diplomatic Corps, and representatives of the chief departments and institutions. In short, everything which the head of the State could do to testify officially the pride and interest of France in her Institute was done simply and heartily. One felt that the President, kindly and gracious as he was personally, represented a national feeling which would have demanded expression no matter what form of Government had been in existence, or what political party had been in power.

Nor was the action of the President the only manifestation of official interest in the celebration. The Prime Minister, the Ministers for Foreign Affairs, War, Marine, Public Instruction, and others found time to spend an hour or two at one or other of the gatherings. The Minister for Public Instruction, M. Poincaré, indeed, multiplied himself in the most astonishing way. Having the official control of the department under which such organisations as the Institute are placed, he evidently considered it to be his duty, as it seemed certainly to be a pleasure to him, to attend every gathering where his presence could testify the sympathy of the Government with the Institute and its objects. At one time he was to be seen at the Ministry of Public Instruction holding a reception of all the academicians and correspondants, with their wives, and a large company of representative men from outside. At another time he was on the platform beside the President, making a vigorous speech, and conveying to the Institute the appreciation which he and his colleagues had of the work which the various Academies had accomplished. Again he was in his place presiding at the banquet given to the Institute, ready once

more with eloquent words to wish prosperity to literature, art, and science. And as if all this were not enough in the midst of his other busy official engagements, we found him just after breakfast at the unveiling of the Meissonier statue in the Louvre Gardens, where he made an admirable speech, summing up the characters of Meissonier's work.

An Englishman might be forgiven if he ventured to express openly his opinion that such things as these could not, or at least would not, be done in his own country. We suppose our Vice-President of the Council is the Minister who most nearly corresponds here to the Minister of Public Instruction in France. But when had we ever a Vice-President who thought it worth his while to show, outside of his official duties, so much active interest in the cause of science, art, and literature?

While this recognition from the State and its functionaries was extended to the Institute, the latter showed in several ways how well it realised its representative character as the outward symbol of the higher intellectual progress of France. One was especially impressed by the way this feeling was exhibited at the opening gathering in the great hall of the new Sorbonne. Behind the academicians and correspondants, the best seats in the building were allocated to representatives of education, law, justice, &c. The chief schools and colleges had places allotted to them, legibly marked out by large labels affixed to them. Lawyers, judges, and professors came in their robes to take part in the proceedings. Every section of the programme appeared to have been most carefully thought out. There was a well-trained orchestra, which began by playing a composition of the first composer who became a member of the Institute of France, and afterwards gave a fragment of *Mors et Vita*, by Gounod—the last composer who had passed away from the Academy of the Beaux-Arts. Good care, indeed, was taken in the celebrations to show that music and the drama were included within the range of the Institute's activities. An afternoon "gala" performance at the Théâtre Français included parts of Corneille's *Cid* and Molière's *École des Femmes* and *Femmes Savantes*, wherein the chief members of this incomparable company showed once more what perfect acting should be.

Lastly, a stranger could not but be pleased with the numerous facilities offered to him to meet his old friends, and to make new ones. At the evening receptions and dinners, at the daylight gatherings in the Institute buildings, and in the foyer of the Théâtre Français, but most of all in the excursion to Chantilly, and the rambles through the rooms and grounds of that princely chateau, he had opportunities of seeing everybody that he wished to converse with. No one who went to Chantilly will be likely to forget the success of that concluding day of the proceedings—the autumnal woods with their long vistas, the magnificent castle, the endless treasures of art and literature within the rooms, but above all, and as the centre and soul of the whole scene, the figure of the Duke d'Aumale, who has gifted all that estate to the Institute. Sitting in his bath-chair wrapped up in black velvet, hardly recovered from his last attack of gout, he showed himself the most vivacious talker in the company, shaking hands with his guests, discoursing to them of pictures, travel, and incidents of his life with the urbanity and dignity of the old *grand seigneur*.

There was one special source of gratification to English visitors in the remarkable band of men who went to represent Great Britain at the Centenary. The French members of the Institute seemed to feel the compliment paid to them by the attendance of so many illustrious men of science, literature and art. And the strength of the English contingent drew forth the admiration of visitors from other countries. It was pleasant, in these days of political rivalry, to see human culture linking men in a brotherhood which stands above nationality and politics, and more especially to note that nearly the whole of the Englishmen who have been so generously recognised by the Institute of France should have attended its Centenary.

THE GOLD MINES OF THE RAND.

The Gold Mines of the Rand; being a Description of the Mining Industry of Witwatersrand, South African Republic. By F. H. Hatch and J. A. Chalmers. (London: Macmillan and Co., 1895.)

AFRICA is proverbially a land of surprises. It is not likely, however, that more startling surprises can be in store than those witnessed by the present generation. We have seen a great city spring up, in what, before the discovery of gold in the Witwatersrand, was a desert, a city with over eighty mines, the workings of which extend east and west from Johannesburg for 45·8 miles. The mines have been worked with regularity, and the augmentation of dividends has attracted the attention of capitalists in all parts of the globe, resulting in the Russian Government commissioning Mr. Kitaeff to report on the gold-field, and in the Prussian Government despatching Mr. Schmeisser for the same purpose. The output of gold from the Witwatersrand has risen from 23,000 ozs. in 1887 to 2,023,198 ozs., valued at nearly £7,000,000, in 1894, whilst the return for the first nine months of the current year was 1,711,337 ozs. The Transvaal now produces one-fifth of the world's supply. It is calculated that at the present rate of progress the output of the Witwatersrand mines will have reached by the end of the century a value of £20,000,000.

To the already ample literature relating to the Transvaal gold mines, this handsome and profusely illustrated volume of three hundred large octavo pages is the most valuable contribution that has yet appeared. The authors possess special qualifications for the important task they have undertaken. Mr. J. A. Chalmers is an Associate of the Royal School of Mines, and his brilliant career as a student has been followed by many years successful practice as a mining engineer in South Africa; whilst Dr. F. H. Hatch's scientific attainments and literary skill are well known from his important petrographical researches carried out previously to his retirement in 1892 from the Geological Survey of England and Wales, and from his useful manuals on mineralogy and petrology.

The authors divide their subject-matter into twelve chapters. The first deals with the history of the gold discoveries and of the development of the mining industry, whilst the subsequent chapters deal respectively with the geology, the auriferous conglomerates, the

Witwatersrand deposits, the development and prospects of deep-levels, mining practice, surface equipments of the mines, the metallurgical treatment of the ore, economics, mining law and statistics.

Unfortunately for students of South African geology, much confusion results from the fact that beds of an identical character often receive different names in different localities. The inconvenience of this want of uniformity in the classification of the rock systems will now, it is hoped, be obviated, as the authors' clear exposition of South African stratigraphy cannot fail to be generally accepted. The geology of South Africa is, it may be noted, comparatively simple. The main subdivisions are (1) recent deposits; (2) the Karroo formation; (3) the Cape formation, and (5) the South African primary formation. The sedimentary deposits are underlain by granites, gneisses, and crystalline schists, which constitute the greater portion of the formation of north-west central Africa. This primary formation occurs largely in Mashonaland, Matabeleland, and the Mozambique, and predominates in the northern and eastern parts of the Transvaal. Lying unconformably on these beds are the shales, sandstones, conglomerates and limestones of the Cape formation, which extend over the southern, western, and middle parts of the Transvaal. They appear to be of an age corresponding with the Devonian and Lower Carboniferous periods of European classification. The Karroo formation, which may possibly be correlated with European Lower Mesozoic formations, has a widespread occurrence in Cape Colony, Natal, the southern Transvaal and the Orange Free State. It derives its importance for the Transvaal from the fact that it carries the coal-seams that have rendered such valuable aid to the development of the auriferous deposits. Lastly, the recent deposits comprise those of alluvial and æolian origin, together with the curious surface material to which the authors apply the somewhat misleading name of "laterite." This material is widely distributed throughout the Transvaal. The gold of the Witwatersrand is obtained entirely from beds of conglomerate, known as "banket," carried by the Cape formation. These are composed mainly of pebbles of white or grey quartz embedded in a matrix consisting originally of sand, but now completely cemented to an almost homogeneous material by a later deposition of quartz. The pebbles as a rule do not carry any gold, the mineralisation being confined to the matrix. The average total yield of the conglomerate stamped last year was 13·16 dwts. of fine gold per ton. With regard to the origin of the ore-bodies, the authors enumerate the various hypotheses without giving their support to any one of them. They have, however, been unable to find any evidence in favour of the idea locally prevalent that the dykes met with, have acted benefically on the banket in their immediate neighbourhood in regard to gold contents. Petrologically the dykes belong to the group of dark-coloured greenstones, among which the authors have recognised the following types: diabase, olivine-diabase, bronzite-diabase, epidiorite, gabbro and olivine-norite.

One of the most interesting chapters in the book is that on the development and prospects of deep-levels. As the bedded character of the banket deposits became known, and as the persistency in depth and the uniformity in the gold-contents became established by deep bore-holes, companies were organised to work the deep-seated portions of the beds. In discussing the depth at which the main bed will be found, the authors bring forward evidence to show that a very important flattening of the bed takes place. They therefore take a more optimistic view of the future of the gold-mining industry than that taken by other writers. The most important problem that presents itself is to ascertain the limit in depth to which mining may profitably be carried. The limiting factors are increased temperature, excessive initial expenditure, and increase of working costs. The rise in temperature with increasing depth must, the authors think, be ascribed almost entirely to secular causes. Unfortunately very few experiments have been made to gauge the rate of increase. Mr. Hamilton Smith in 1894 made some determinations of the water in the Rand Victoria borehole at a depth ot 2500 feet, the results indicating an increase of 1° F. for every 82 feet. Some rough determinations, too, have been made by Mr. A. F. Crosse at the Ferreira and Crown Deep shafts. In view of the scientific interest and commercial importance of the matter, it is to be hoped that an accurate determination of the temperature will be made at the bottom of the borehole which is now being put down to intersect the main bed at a depth of 3500 feet. At present, experience in other countries is the only available guide, and it is to be regretted that such results collated by the authors are very incomplete. A table of temperatures in some deep European and American mines is given (p. 104), but this, being disfigured by gaps and misprints, such as St. Andre for St. Andreasberg, Prizebram for Przibram, Sanson for Samson, Lambert for Charleroi, does not carry much weight. Nor are the shafts of the Michigan copper mines fair illustrations to select, inasmuch as the coolness of the rock is undoubtedly due to the proximity of the cold waters of Lake Superior. The authors' statement that at the Calumet and Hecla shaft, Michigan, there is a rise of only 4° F. in a depth of 4400 feet, is certainly inaccurate. The temperature determination must have been influenced by the fact that compressed-air rock-drills are in use at that mine. The ice-cold exhaust would lead to erroneous results. The usual geothermic gradient is 50 to 55 feet for an increase of temperature of 1° F., and the lowest recorded is that of 100 feet to 1° F., at the Lake Superior copper mines. It would appear, therefore, that in assuming it to be somewhat less than this in the Rand, the authors are taking too optimistic a view, more especially as Mr. Crosse's determination (p. 103) of 66·7° F. at 825 feet, and 70·7° F. at 1030 feet, indicate the normal gradient of 50 feet to 1° F. In the discussion of this important subject, the authors might have referred with advantage to Koebrich's 387 determinations of temperature in the Schladebach borehole. These are of special importance, as they were taken at fifty-eight points at equal distances of 30 metres down to the greatest depth yet attained of 1716 metres. The result of this investigation was that the gradient was found to be 46·09 metres for 1° R.

The chapters describing mining practice, surface equipment, and the metallurgical treatment of the ore, occupy more than a third of the volume. Admirably illustrated by

excellent drawings and photographs, they give a clear idea of the vigorous manner in which the work is carried on. Additional authority is given to them by the fact that they contain contributions by Mr. L. I. Seymour, Mr. C. Butters, and other leading engineering experts. The volume concludes with valuable information regarding material and supplies, labour, working costs, mine accounts, mining laws and regulations, production and dividends. A good index, eighty illustrations, fourteen photographic plates, and seven folding maps and plans, complete a volume of which the authors may justly be proud. With the exception of a geological map, which would have been a useful addition, the only omission appears to be a bibliography of the existing literature relating to the subject. The authors appear to be unacquainted with the geological work of Mr. C. J. Alford (London, 1891), and with the engineering descriptions of Mr. T. Reunert (London, 1893). Indeed they regard the published information relating to the nature of the ore deposits and to the extraction of the gold as meagre and inadequate. Yet Mr. W. Gibson in 1892 published a list of sixty-seven works on South African geology, sixteen of which bear directly upon the geology of the Transvaal. Mr. Schmeisser in 1894 gave the titles of fifty such works, and Dr. K. Futterer in 1895 gave 156 titles. With the rapid development of the mining industry, literary productions become antiquated with remarkable rapidity. When the writer of this review visited the Witwatersrand in 1892, there were 1907 stamps running. Now, according to Dr. Hatch and Mr. Chalmers, there are 2642 (June 1895). Since 1892 work has been pushed on more vigorously than ever before, and from the sixty mines near the outcrop of the main bed 5,000,000 tons of ore have been extracted in 1893 and 1894. Numerous deep boreholes have been put down to the dip of the bed, and several shafts have been sunk, encountering the auriferous conglomerates at depths of 600 to 1000 feet. Five years hence there will be 8000 stamps running. The present average stamping capacity is over four tons per stamp per day, and it is probable that, owing to technical improvements, the average will be five tons. With a total extraction of 10 dwts. of gold per ton, the output should be 6,500,000 ounces. The ore reserves are estimated at 170,000,000 tons, equal at 45s. per ton to £382,000,000. It seems unlikely that the average cost of mining and treating this ore will exceed the present cost of 30s. per ton. The authors think, therefore, that they may safely forecast a production from the Witwatersrand within the next half-century of £700,000,000, of which £200,000,000 will be profit.

BENNETT H. BROUGH.

STARCH.

Untersuchungen über die Stärkekörner. By Dr. A. Meyer. (Jena: Fischer, 1895.)

THOSE who are best acquainted with the laboured details of Naegeli's classical investigations into the nature and growth of starch-grains, and the controversy which followed regarding his astounding hypothesis, which so long dominated certain of our text-books under the name of the "intussusception theory," will best be prepared for another huge work of inquiry into the physical and chemical nature, growth and solution, and significance to the plant generally of those curious structures. The full appreciation of the magnitude and value of Meyer's task will depend on the reader's acquaintance with the bearing of numerous discoveries which have been made since Naegeli's day, and turned to criticism and the final overthrow of his hypothesis; and among these stand prominently, on the biological side, Schimper's demonstration of the significance of the various plastids to the stratification of the starch-grain, Sachs' brilliant work on the *rôle* of the starch-grain in assimilation, and Strassburger's severe criticisms in his researches on the structure and growth of the cell-wall; and, on the physical and chemical side, Émil Fischer's work on the synthesis of carbohydrates, and the splendid work of our own countryman Horace Brown—the latter, indeed, as much physiological as chemical in its methods and results.

Meyer's book, which contains over 300 large pages of closely-printed German in the dryest of styles, which would be hard to forgive if the matter were not so good and the spirit so enthusiastic, covers the whole range of the enormous domain now centred around this formerly so insignificant a structure, the starch-grain; and it is embellished with nine tables and ninety-nine illustrations, good, bad, and indifferent, for the quality of the figures varies much, suggesting periods of different powers or methods of delineation during the fifteen years or so the author has been occupied with this monumental monograph.

For it *is* monumental, in the sense that it has evidently been gradually built up as a big structure, bit by bit, with morsels of hard evidence dug with great labour from the difficult quarry of facts, only to be worked with the best powers of the microscope, and the best methods which modern technique puts at the disposal of the investigator.

The work may be regarded as divided into five parts. The chemistry, physics, and biological properties of the starch-grain as an object of research, form the subject-matter of three of these parts; the fourth is occupied with some extremely ingenious and careful comparative studies of the changes undergone by the grain in the different organs of various selected plants, at stated seasons, and under experimentally varied conditions; while the fifth part may be taken as the critical survey of the investigations and views of others scattered through the body of the work, and the copious literature collected at the end.

It is, of course, impossible to traverse a work like this in a review, and the following short summary must suffice for a glimpse at Meyer's views and results, some of which he has already published in short papers from time to time.

He regards the typical starch-grain as consisting of two substances, one of which, *α-Amylose*, can be obtained separately in the crystalline form, whereas the other—*β-Amylose*—cannot be isolated in crystals. The relations of these two constituents to each other, and to other carbohydrates found in modified starch-grains, are considered in detail; they occur in the grain itself as acicular crystals (*trichites*) arranged more or less radially, and the starch-grain is in effect nothing but a complex, mixed sphere-crystal composed of radiating branch-systems of these *trichites*, in different proportions, and more crowded in the denser layers than in the softer ones.

The cases where amylo-dextrine occurs, and the relations of all these substances to other carbohydrates, their behaviour in water of various temperatures, the action of diastase, and so forth, are discussed at great length, and we are glad to see that the author has paid attention to, and, it may be added, been considerably influenced by, the valuable work of Brown, Heron, Morris and Salomon, and there are points of discussion of interest to all these workers.

Of course a view like Meyer's must depend for its validity essentially on what experimental results can be got in the way of obtaining sphere-crystals of carbohydrates like amylose under known conditions; if the author's statements regarding the crystallisation into spherites of inulin and amylodextrin and other bodies in a viscous matrix can be extended to the case in point—where the protoplasm of the amyloplast acts as the viscous matrix—he has certainly made out a strong case, for all the ordinary physical properties of porosity, behaviour to polarised light, swelling, and the stratification, striation, and other structural peculiarities of the starch-grain are as easily explained if the unit of structure is a *trichite* as where it is assumed to be a *micella*.

Since it is as yet impossible to artificially crystallise the amylose composing the chief part of a normal grain, into the spherical shape, however, the war of discussion will no doubt rage around this point; in the meantime, Meyer has unquestionably marshalled his facts in heavy order and made out an ingenious case, the full significance of which can only be grasped by ploughing one's way through his heavy, but, in the main, logical German.

The phenomenon of swelling has always been a crux in hypotheses regarding the structure of organised bodies. Meyer explains it as due to the *trichites* of *β-Amylose*—the principal constituent of the normal starch-grain—absorbing water, and themselves swelling. In other words, the water dissolves in the crystals.

It should be noted, however, that Meyer distinguishes sharply and emphatically between *Porenquellung*, where water is merely imbibed between the crystals, and *Lösungsquellung*, where the water is taken up by the crystals; and he here emphasises what may be a useful distinction in questions of imbibition. It is, of course, *Lösungsquellung* which initiates the disorganisation of the grain.

In the discussion of the question as to the growth of the starch-grain, the author points out that the latter may grow in chromoplasts, as well as chloro- and leucoplasts, and that the grain *never* impinges on the cytoplasm—it is always completely surrounded by a layer, however thin, of its plastid so long as the cell lives; he makes this seem probable, but it is impossible to prove it in some instances. In any case, the reader will find some pretty staining methods brought to bear on the point.

Of course the grain grows by apposition, and the thickness of the layer deposited depends on that of the protoplasm in contact at the place. On the whole, indeed, the laws of growth and stratification are those laid down by Schimper and Strassburger, though Meyer adds a good many facts as to the initiation and growth of both simple and compound grains, and has devised a new nomenclature and classification of the various kinds of starch-grains which, complete and exhaustive though it appears, we confess does not seem to meet the requirements of clearness and simplicity so fully as could be desired.

One of the most ingenious chapters in the book is that on the solution of the grains in the cell, and the significance of fissures and pores for the attack of the diastatic or other solvent.

Space is not available for detailed remarks on the author's methods of examining the changes which the starch-grains undergo in the various organs of *Adoxa*, *Hordeum*, *Dieffenbachia*, *Pellionia*, *Hyacinthus*, *Oxalis*, &c., at different times of the year and under different conditions; nor to give his views on the constitution of protoplasm—which we venture to think too much of the nature of a hastily-written note, moreover not necessary to the subject, and far from convincing in the six pages (with critical sentences on everybody from Naegeli and Wiesner to Bütschli interspersed) devoted to it. Put briefly, Meyer regards protoplasm as a peculiar emulsion, and therein agrees essentially with Berthold; whereas the elements of cell-walls and starch-grains are as truly crystallised out as is calcium oxalate.

The experiments showing that the position of the layers of the starch-grains can be altered by changing the position of the organ in which they are growing, and that the alternation of day and night is expressed in the thickness and density of the layers—that the layers are "diurnal layers"—in effect (pp. 268–271) are well worth attention, however, as indeed are very many others of the difficult experimental points brought out towards the end of the book.

That the questions centering around the starch-grain have not reached finality, is obvious, but that Meyer has contributed a valuable attempt to set some of them at rest, must be admitted by all who read his monograph. It bristles with debatable points, and there are some annoying faults—*e.g.* the frequent references to figures and titles in the text without sufficient clues, and to chapters ahead of the reader; but that does not weaken the fact that his results stimulate the reader to some close thinking, and his critical compilation of the history and literature of the subject alone makes the book necessary to all working botanists.

H. MARSHALL WARD.

APPLIED METEOROLOGY.

Weather and Disease. A Curve History of their Variations in Recent Years. By Alex. B. MacDowall, M.A., F.R.Met.S. (London: The Graphotone Co., 1895.)

THE systematic study of climatic conditions in connection with the fluctuation in the public health, is one which has only recently been undertaken, but which already promises results of a most interesting and important character. Apart from the inherent interest of the subject, which must indeed be apparent; the study offers, like observations in phenology, the prospect of great practical value. The work of weather forecasting is at present so wanting in accuracy, and there is so little promise of progress in this direction, that practical meteorologists might be tempted to despair, and the general public be led to imagine that the vast stores of records which have been accumulated were destined to

remain fruitless for an indefinite time. The application of meteorology to related subjects in general, and to hygiene in particular, may thus be considered doubly welcome.

Mr. MacDowall's primary object, in the publication before us, is to represent the variations which certain elements of the weather, and the mortality from certain common diseases have undergone during recent years, and it may be to find a connection between the two. The mode of representation which the author has adopted is the one now commonly in use of plotting curves on ruled paper, by adjoining points, the ordinates of which are determined by the two quantities to be related, one of which generally refers to date. These curves have as a rule been subjected to a process of *smoothing*, which, by recording the average of every five or ten (as the case may be) consecutive values, eliminates the fluctuations of short duration, while preserving the more gradual and lasting variations. The great advantage which this method possesses is, it is hoped, to enable the eye at once to detect the more salient features of a general tendency, without the mind being distracted by a mass of details which may be, for the purpose in view, absolutely useless. In this way, within the compass of some twenty curves, the author exhibits the general tendencies which have controlled the principal and most interesting features of the weather; while a further sixteen curves show the fluctuations which have taken place in the most important zymotic diseases.

If we have any fault to find with a very excellent purpose, on the whole admirably carried out, it would be to remark that the curves would be better if drawn on a larger scale. This would have increased the expenses of production, but the result would be clearer. It would have been of advantage, too, if the numerical details, from which the curves have been drawn, had been given; then any one interested in a particular inquiry could have easily constructed the curve to any desirable scale. This point is of particular importance if the reader wishes to know what is the "probable error" of any point on the smoothed curve, or, in other words, what is the degree of reliance to be placed upon the process of smoothing. For instance, a comparison is instituted, or at least suggested (p. 63), between the curves representing the mortality from diarrhœa and dysentery, and that showing the mean temperature for July at Greenwich. There is apparently some resemblance between the two, but the probable error of either curve may be greater than this apparent agreement. If the solution of a system of equations of condition, to which these curves may be compared, yield the quantity sought, accompanied by a probable error as large as the unknown itself, great hesitancy is experienced in accepting the result as a satisfactory solution.

Mr. MacDowall's aim is apparently a modest one: for the most part he is content to leave his graphic representations of both kinds of records to speak for themselves, and invites the reader to study them independently, and to follow up any point which they may suggest. The author's own notes are not copious, but they are clear, interesting, and concise. Some of the curves, too, are very instructive. The opponents to compulsory vaccination will not find much to support their views in the curve tracing the mortality from small-pox through the last two centuries. The steady and consistent improvement in the twenty years following the introduction of vaccination, in 1798, pleads eloquently in favour of the process. The great decrease shown in the number of deaths from scarlet fever may be misleading, if it be not compared with the sad and alarming increase in the mortality from diphtheria. Previous to 1859, these two diseases were not separately registered in the Registrar General's Reports; but if the two curves be combined, the mortality from neither has conspicuously varied.

The book, small as it is, appears to have been carefully compiled, and must have involved a considerable amount of labour in its production. It should certainly be consulted by those who are interested in the relations between meteorology and hygiene. W. E. P.

OUR BOOK SHELF.

Popular History of Animals for Young People. By Henry Scherren, F.Z.S. Pp. 376. (London: Cassell and Co., Limited, 1895.)

WHAT would have been said a few years ago of a popular history of animals of which the opening chapters were devoted to man and his resemblance to other members of the Order Primates? In the days when it was the fashion to place man in a separate order of Bimana, while the man-like apes were called Quadrumana, the mere idea of including the human race in the animal kingdom would have raised a storm of indignation. Yet here we have a book, intended for a popular public, in which the principle of relationship is fully recognised, and man is assigned his proper place in nature. Thus do the scientific ideas which are anathema of one generation become the accepted truths of the next.

One of the features which distinguish this book from most of the legion of popular works on natural history published in recent years, is that common names of animals are used throughout, and no attempt is made to familiarise the reader with the nomenclature of scientific zoology. This fact will endear the book to all who like to learn a little about the habits of animals, but have no desire to know any details. For such readers the present volume is admirably suited; it is full of readable anecdotes about animals, and is illustrated with thirteen coloured plates, as well as numerous figures in the text. Most of the illustrations, both coloured and plain, are old friends, but a few have been reproduced from photographs. We think the volume will be successful as a prize-book and as a book for general readers.

Simple Methods for Detecting Food Adulteration. By J. A. Bower. Pp. 118. (London: Society for Promoting Christian Knowledge, 1895.)

THE author describes a number of simple tests for detecting common adulterations in articles of food. In the main, the tests described can only be carried out by means of a fairly good microscope, so they are quite beyond the ordinary householder until he provides himself with such an instrument, and educates himself in the use of it. Of the thirty-six illustrations in the book, twenty-eight represent microscopic views of various substances, and it will be of little use for any one to set about detecting fraud until he is perfectly familiar with the varying appearances exhibited not only in the illustrations, but by actual specimens mounted on slides. Possibly the book will induce young people to determine specific gravities, and make other simple observations; and if it does that, it will justify its existence.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Introduction of a West Indian Frog into the Royal Gardens, Kew.

A SHORT time ago Mr. W. Watson, the Assistant-Curator of Kew Gardens, informed me that he had noticed for several years, in some of the hot-houses, specimens of a small frog, which, hiding away during the day among the pots and orchid-baskets, enlivened the quiet evenings with their shrill, whistling notes. Suspecting that this frog must be a foreign importation, I asked the Director to allow some of the specimens to be caught, and some days ago I had the pleasure of receiving three specimens in excellent condition.

The frog is *Hylodes martinicensis*, a small arboreal species, distributed over, and common in, many West Indian Islands (Martinique, Porto Rico, St. Vincent, Dominica, Barbadoes, &c., and possibly in Trinidad). Mr. Watson recollects that he observed it first some ten years ago, that he lost sight of it for some time, but that it reappeared about four or five years ago. Taking into consideration the few facts with which we are acquainted as to the reproduction of this frog, it seems most probable that several specimens of both sexes were, on more than one occasion, accidentally introduced in Wardean cases.

However that may be, it is evident that the frogs have freely propagated since their introduction. At present they are most numerous in the propagating houses, in which the temperature ranges between 80° and 100°, sinking in winter at times to nearly 60°. Accompanying Mr. Watson one evening, I heard from several points the call of the frogs, which somewhat resembled the piping of a nestling bird; and guided by the sound, I had soon the pleasure of seeing one of them clinging to the side of a glass-case.

There is nothing extraordinary in the accidental importation of individuals of a tropical species of frog into Europe; but it is an interesting experience, that the species should have permanently established itself. This is owing, in the first place, to the favourable conditions under which it found itself placed, and, secondly, to the peculiar mode of its propagation.

Hylodes martinicensis, and probably the majority of its congeners, does not spawn in water, but deposits from fifteen to thirty ova on leaves in damp places. After a fortnight the young frogs are hatched in a perfect form, having passed through the metamorphosis within the egg, thus escaping the vicissitudes and dangers to which they would have been exposed during the progress of the usual Batrachian metamorphosis.

This instance of the acclimatisation in Kew Gardens of the "Coqui" (as the frog is called in Porto Rico) is unique in Batrachian life at present. I trust that the little guest may long flourish where it has found such a congenial home, and where it usefully aids in the destruction of plant-eating insects and wood-lice, of which I found great numbers in the stomach of a specimen. If at a later period a nest with ova were discovered, Mr. Dyer would delight the heart of embryologists, to whom the opportunity of examining fresh ova of this frog would be most welcome. ALBERT GÜNTHER.

Kew, October 20.

The Cause of an Ice Age.

IT appears to me that the position taken up by Sir Robert Ball in his book, "The Cause of an Ice Age," is seriously misrepresented by Sir H. Howorth in one paragraph of the criticism which appears in NATURE of October 17. Sir H. Howorth says, that the fact of the invariability of the ratio of the heat received by our hemisphere in summer to that received in winter cannot be the cause of variability in climate; "if, as we are told in the book over and over again, this particular proportion (63 : 37) is the cause of the Ice age, we must be living in an Ice age now, and we must always have been living in an Ice age." Now it is nowhere asserted by Sir Robert Ball that the invariability or the magnitude of this ratio is the cause of an Ice age, but it is very clearly explained that he assumes the cause of an Ice age to be a *particular range of positions of the line of equinoxes combined with a high value of the eccentricity of the earth's orbit*, and that the fact that the above ratio is 63 : 37, and not unity, as appears to have been supposed to be the case, is relevant only so far as it inclines us to regard the changes of climate due to the causes just mentioned as much greater than we might otherwise have regarded them.

It seems obvious that a large value of the eccentricity contemporaneous with a favourable position of the line of equinoxes will correspond to *some change* in climate. Whether this cause is a dominant one, or even an important one, in its effect on climate, is of course an open question, and one upon which I express no opinion. Sir H. Howorth thinks that Sir Robert Ball has inadequately recognised the fact that the ratio of heat received in summer to that received in winter by one hemisphere has been calculated by Wiener. I find, however, on page 90 (second edition), the following reference to Wiener's work. "They depend on the mathematical calculation given for the first time, I believe, by Wiener in his work, "Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie," vol. xiv., 1879, p. 129. . . . My chief object is to emphasise the relation of these calculations made by Wiener to the astronomical theory." Wiener's work is also mentioned in the preface.

On the general question as to the adequacy of Croll's theory, with or without the fact which Sir Robert Ball adduces *solely* with a view of strengthening that theory, I express no opinion; it seemed to me, however, that in fairness, some of the remarks made by Sir H. Howorth required refutation.

Christ's College, Cambridge. E. W. HOBSON.

Green Oysters.

ONLY to-day I was able to read Prof. Lankester's letter (NATURE, May 9, 1895), and wish to reply briefly. My note in *Monitore Zoologico* was simply a preliminary communication; the proofs of my assertions will be given *in extenso* in a paper which will soon be published. My conclusions in that part which may interest the previous labours of Prof. Lankester may be briefly expressed as follows:—

(1) My observations have always been made on true *huîtres de Marennes*.

(2) I believe that Prof. Lankester must have overlooked the recent works on the histology of Molluscs by Janssen, Rawitz and others, or he would have seen that his "gland cells" are the *becherzellen*, *cellules caliciformes* of the authors quoted; which are inside the branchial epithelium, and not on its surface, and never can be considered wandering, nor can they have amœboid movements. It would be strange, therefore, to consider such "gland cells" as similar to the amœbocytes of the blood!

(3) Prof. Lankester says that the "gland cells" contain green granules in the Marennes oysters, but this is entirely due to an optical illusion; if one examines a fresh piece of branchial lamella of the green *huître de Marennes*, the "gland cells" appear green, but if these cells be separated from the epithelium, one finds that they are always colourless, and that they appeared green because they are surrounded with green matter. Making careful sections of the branchial lamellæ or the labial palps, one finds clearly: (*a*) that the gland cells are never green; (*b*) that the superficial epithelium is green; (*c*) that some amœbocytes and large masses included in the epithelium are also green. I am ready to furnish Prof. Lankester with microscopical preparations showing what I assert.

(4) The green of the Marennes oysters is not a hurtful substance which must be got rid of, and it is incorrect to imagine a defensive phagocytosis performed by amœbocytes. To me it is quite obvious that the green colouration is merely due to a true assimilation of nutritive substance which takes place through the agency of the epithelium in some portions of the intestine and in the branchial lamellæ. And no doubt it is the amœbocytes who carry the green substance, assimilated from the epithelium, to the liver. I am quite aware that these results of my researches are new, and it is for this reason that in communicating them to the *Monitore Zoologico* I noted that they are of some importance to our further knowledge of the physiology of mollusca.

(5) It is a mistake to believe that the oysters are green because they feed on *Navicula ostrearia*; the truth is that the alga is green for the same reason that the Marennes oysters are so, which is from the nature of the *parcs* and *claires* bottom. It is therefore the same substance, viz. the blue pigment "Marennin," which is found in both.

(6) The chemical part of my work is not concluded, and I

fear that I shall not be able to finish that most difficult task. But I may note that my assertion that "Marennin" contains principally iron, is based on the recent researches of Muntz and Chatin. D. CARAZZI.

Spezia, Italy, October 12.

Oxford Endowments.

I AM surprised that my friend Dr. Hickson, whose past residence among us lends authority to his words, should so greatly misrepresent facts as to say, in NATURE of October 3, that "the income of the [college] endowments is frittered away in the salaries of the heads, the stewards, the bursars, and the tutors of the pass-men," the fact being that these endowments do not provide the salaries of either the stewards or the tutors. It is further difficult to see how estates can be managed without bursars, and how bursars can exist without salaries; how complex institutions can work without heads, and how heads can live on nothing; and how the payments to bursars and heads—the latter at least with stipends fixed by statute—is in any way connected with "the [alleged] unfortunate competition that exists between colleges."

Christ Church, Oxford. R. E. BAYNES.

I AM sorry that my friend Mr. Baynes should think that I have "misrepresented facts" in my article on the "Linacre Reports." I did not state, nor did I intend to imply, that the whole of the salaries of the tutors and stewards is derived from college endowments; but surely it is true that in the majority of cases these officers are fellows of their colleges, and as such receive a substantial sum of money annually from the college endowments.

I am quite competent to understand that college estates cannot be managed without bursars, and that bursars cannot live without salaries; but the estates of the Oxford colleges could be managed by less than half the number of bursars that now exist in Oxford—provided that they were chosen carefully from among those who have had some training or experience in their profession—and a large annual income would be saved from the endowments.

As to the heads. Speaking with every respect for these august persons, I still feel that with judicious amalgamation three or possibly four heads would be sufficient to carry on the official work, they now perform, with efficiency and dignity.

I should exceedingly regret if any remarks of mine should give offence to my friends in Oxford; but I never hesitated to express my opinion there or in Cambridge, that the independence of the colleges means a fearful waste of their endowments; and until, by Act of Parliament, a suitable amalgamation of these institutions is brought about, there will be little margin left for the endowment of research and the payment of those engaged in pure scholarship. SYDNEY J. HICKSON.

Late Leaves and Fruit.

HERE, many of the roadside lindens have cast their summer foliage, and put forth a garniture of new leaves; these are fully grown, and bear the vivid tint of spring. In this city, on the 11th inst., well-grown open-air strawberries were on sale in the fruiterers' shops. The quantity altogether amounted to several bushels. J. LLOYD BOZWARD.

Worcester, October 19.

THE CENTENARY FÊTES AT PARIS.

THE latter part of last week has witnessed the celebration of the first centennial anniversary of the foundation of the Institut de France. Paris was certainly not at its best, as far as meteorological features were concerned; the weather offered nothing "Queenly" or "Presidential" in its demeanour, and upon the whole was what it generally is at this time of the year—unpleasant, wet, and cold. But it hardly interfered with the proceedings and festivities, and we trust none of the generally aged guests of the Institute will be any the worse in health for their rapid visit to Paris.

A large number of foreign associates and corresponding members had promised to come; and the occasion was such a remarkable one, that we print in full the list of acceptations. Of the Académie des Inscriptions et Belles-Lettres, the Associés étrangers present were MM. Ascoli, Helbig, Max Müller, Whitley Stokes; while the Correspondants present were MM. Bailly, de Beaurepaire, Blade, Blancard, Champoireau, Chevalier, Comparetti, Delattre (le Père), De Smedt, Sir John Evans, Goeje, Gomperz, de Grandmaison, Ioret, Kern, Merlet, Millardet, Naville, Radloff, Saige, Sauvaire, Windisch. In the Académie des Sciences, the Associés étrangers who attended were Lord Kelvin and Dr. Frankland; and the Correspondants were MM. Amagat, Arloing, Bäcklund, de Baeyer, Bayet, Bergh, Bichat, Blondlot, Brioschi, Cannizaro, Considère, Crova, Engelmann, Sir Archibald Geikie, Gosselet, Grand Eury, Haller, Herrgott, Houzeau, Kovalewski, Laveran, Lépine, Lie (Sophus), Lockyer, Marès, Marion, Masters, Matheron, Ollier, Pagnoul, Ramsay, Raoult, Rayet, Retzius, Sir Henry Roscoe, Sabatier, Sire, Sirodot, Stephan, Sir G. Stokes, Suess, Sylvester, Général Tillo, Treub, Vallier. In the Académie des Beaux-Arts there were the Associés étrangers, MM. Alma Tadema, Da Silva, Gevaërt, Pradilla; and Correspondants, MM Bertrand, Biot, Civiletti, Cui, Cuypers, Dauban, Deffés, De Geymüller, Gouvy, Guffens, Israëls, Lanciani, Le Breton, Loenhoff, Marionneau, Martenot, Perrin, Ronot, Salinas, Salmson, Sgambati, de Vriendt, Waterhouse, Wauters. In the Académie des Sciences Morales et Politiques, the Associés étrangers present were MM. Carlos Calvo and Castelar; and the Correspondants were MM. Aubertin, Babeau, Barkausen, Bodio, Caillemer, Ducrocq, Du Puynode, Ferrand, Lallemand, Lecky, Legrand, le Comte de Lucay, Molinari, Moynier, Sir F. Pollock, Polotsoff, Raffalovich, Stubbs, Villey Desmeserets, Worms.

At one time, it had been decided to choose the epoch of the centennial anniversary for the transfer of Pasteur's mortal remains from the vaults of Notre Dame to their final resting-place at the Pasteur Institute. The plan was not carried out, and it was better so. The frame of mind which is suitable for festivities is not so for a funeral, and it would not have been in good taste to mingle the one with the other. The plan was dismissed after short, but wise, reflection. The festivities were carried out in strict accordance with the announcements made, and published in NATURE.

On the first day, the 23rd, a religious service was celebrated in Saint Germain des Près, in memory of all members of the Institute deceased since its foundation, by Monseigneur Perraud, Bishop of Autun, a member of the Académie Française, and a very distinguished writer and philosopher. It must not be thought that, even in the land of Voltaire, all men of science consider atheism as "the" proper form of philosophy. The Institute is very conservative, and whatever opinions most members may hold concerning religion and dogmas, every man has his own conception of the universe, more or less, and entertains "son petit religion à part soi," as a witty German princess put it, in her own barbarian French. This first ceremony was largely attended, although more national than international in character. The real general opening of the celebration took place the same day at 2 p.m., when the foreign associates and correspondants were received and entertained in the salon of the Institute by the members of the latter. Each *invité* was announced by the *huissiers*, and after having been introduced to the masters of the house, joined his own personal friends and acquaintances in pleasant conversation and numerous introductions to fellow-workers of every land. The masters of the house were M. Ambroise Thomas (the author of *Mignon*), member of the Académie des Beaux-Arts, and for this year President of the Institute, assisted by MM. Maspero, Marey, Léon Say, Count Delaborde, delegates of the four other Academies. The last function of the day was a general reception of all members,

associates, and correspondants by the Minister of Public Instruction. The reception-rooms of the Ministry had been very elegantly adorned for the purpose. A whole series of tapestries—from the celebrated Gobelins manufactory—illustrating Don Quichotte's life, after the pictures by Coypel, decorated the walls of a large hall which had been built for the purpose, at the end of which a stage had been erected. M. Poincaré, the Minister, received most cordially his guests, who comprised, besides the members of the Institute, a large admixture of very different elements, among which political men were predominant. A very pleasant evening was provided by the singers and actors, among which were the best of the Opera and of the Théâtre Français, and by the excellent orchestra of the Opera.

On the next day (Thursday, 24th) a general meeting was held in the large hemicycle of the new Sorbonne, so splendidly decorated by the paintings of Puvis de Chavannes. The President of the French Republic was present with such Ministers as were not professionally detained at the Chambre des Députés, and after the overture of Méhul's *Joseph*—Méhul was the first composer who belonged to the Institute—three speeches were delivered. M. Ambroise Thomas began, and was short. M. Jules Simon came next, but, as his voice is weak, he could not possibly make himself heard in more than a small fraction of the hemicycle. M. Poincaré, the Minister of Public Instruction, spoke last, and very appropriately. This long ceremony ended with a fragment of *Mors et Vita*, of Gounod, played by the orchestra of the Opera.

In the morning a short reception took place at the Elysée, where the President of the Republic received the foreign members of the Institute. The foreign associates and correspondants, to the number of fifty-five, were presented to President Faure by the office-bearers of their respective Academies. The President welcomed them, and held a short conversation with each, and M. Gaston-Boissier presented him with three volumes containing the minutes of the Institute since its foundation.

In the evening a banquet took place at the Hôtel Continental; two hundred and fifty members were present. After two short "after-dinner" speeches by M. Ambroise Thomas and M. Poincaré, M. Max Müller, acting as spokesman for all the foreign members and associates, proposed the health of the Institute, "which, alone, remains unaltered and immovable in its renown and glory, while so many things have changed during this century," in very excellent terms. Most happily inspired was Lord Kelvin in his address. The very cordial and sympathetic expression which the Royal Society gave to its feelings in its address to the Institute, was received with much satisfaction, and the few words which closed the orator's speech went to the heart of all Frenchmen: "Personally, I cannot express how much I appreciate the great honour you have done me in electing me among the associates of the Institute. But I owe to France an even greater debt. She has been, truly, the *alma mater* of my scientific youth, and has inspired my admiration for the beauty of science, which during my whole life has kept me chained in her service. It was Laplace who initiated me into celestial mechanics, and a few years later the venerable Biot led me by the hand and introduced me to Regnault's laboratory. To Regnault and Liouville I shall eternally be grateful for their kindness towards me, and for the solid teaching they gave me, in 1849, on experimental physics and mathematics. M. President of the Institute, gentlemen, I thank you with all my heart. From what I have said, you will understand why I consider with perfect gratefulness France as the *alma mater* of my scientific life." Lord Kelvin spoke with his heart as well as with his reason, and the great applause which followed his speech must have told him that he had made no mistake in doing so.

The 25th was devoted to an afternoon in the Théâtre Français; the programme, to be sure, was of somewhat an austere character. The *Cid*, the *École des Femmes*, and the *Femmes Savantes* were exceedingly classical and sedate. . . . though, what might have been put in their place we could hardly decide, and classics were probably more suitable for an audience comprising a large number of foreigners than some modern play, where the *finesses* might have been a little too subtle and delicate. A very nobly-felt and worded poem by Sully Prudhomme—the most philosophical of French poets of the period—was read by Mounet-Sully, the *doyen*, the veteran of the French theatre. In the evening a reception was held at the Elysée by the President, who most graciously shook hands with the foreign members who had already been at the Elysée in the morning. The members of the Institute were all but lost in a crowd of political men, senators, deputies, officers, and functionaries who had been invited to meet them.

The last act was a visit to the magnificent residence of Chantilly, to the Duc d'Aumale. A special train left the Northern Railway Station at 11.15 a.m., carrying 239 members, and at Chantilly eleven large vehicles transported the whole assembly to the chateau, through part of the woods, the race-course, and the stables. The Duke, who had hardly recovered from an attack of gout, had to receive his guests sitting in a rolling-chair, and received them most cordially. Lord Kelvin and other members of the British contingent had some conversation with the Duke in English, and the afternoon was devoted to inspection of the residence itself, which has been splendidly enlarged and embellished by the present proprietor, and to the surrounding grounds. The whole of Chantilly and of its contents, as we have already said, has been bequeathed by the Duke to the Institute. This represents nearly £2,000,000, exactly 43,000,000 francs. As the Institute owns already some 25,000,000 francs (£1,000,000), at the death of the Duke the whole amount will be of some 70,000,000 francs (under £3,000,000). The whole Institute distributes over 725,000 francs in prizes each year.

And now the festivities are over, and most of the Institute's guests have gone back to their home or country—may their remembrances be pleasant. They have met some of their fellow-workers, and new friendships have been formed. Such meetings are profitable. While ill-feeling between nations are being daily suggested and excited by the incautious and ill-advised prose of a number of irresponsible men, it is well that occasionally the heads and lights of different countries should meet and mingle together. Knowing each other better, appreciating each other, united by a same bond to a same faith, they may, by their influence, help to further the advent of the reign of reason and goodwill. A great number of men, like Moses, have already expired in view of the Promised Land; and doubtless many more will do the same. The Promised Land seems very remote, and hardly "promised." But this is no reason for not doing what should be done, and international assemblies of the "best of the land" cannot fail to exert a useful influence.

HENRY DE VARIGNY.

This account of the *fêtes* would be incomplete if we did not give M. Jules Simon's discourse on the Institute, the delivery of which formed the central feature at the meeting in the Sorbonne. As M. Jules Simon is the foremost French orator, and his style is remarkable not only for its brilliancy but for its terseness, we give the whole oration as it was delivered.

MESSIEURS,—Quand le général Bonaparte prit le commandement de l'armée d'Égypte, il signa aussitôt de la façon suivante ses proclamations et ses ordres: "Bonaparte, général en chef, membre de l'Institut," "bien sûr, disait-il, d'être compris du dernier tambour."

L'Institut n'avait pas trois ans. Il a fait depuis ce temps-là quelque bruit dans le monde. Je ne puis donc me flatter d'apprendre à personne sa courte et glorieuse histoire. Je la résumerai en quelques mots pour nous réjouir en commun de ses grandeurs et non pour nous en instruire.

Les grandes assemblées qui prirent en mains le sort de la France à la fin du XVIII[e] siècle eurent dès leur premier jour l'instinct révolutionnaire. Elles ne se proposèrent pas pour but de conserver les institutions existantes en les améliorant et en les purgeant de leurs abus; elles firent partout table rase, et quand elles eurent tout renversé, elles s'occupèrent, en liberté, de tout reconstruire.

Les académies avaient largement contribué à l'avènement de la Révolution. A peine eut-on passé de la théorie à l'action qu'elles trouvèrent qu'on allait trop loin. Elles avaient voulu réformer; on ne songeait plus autour d'elles qu'à détruire. La Révolution, de son côté, fit comme toutes les revolutions: elle oublia ce qu'on lui avait donné et s'irrita de ce qu'on lui refusait.

Elle se borna d'abord à des mesures malveillantes.

L'Assemblée constituante vota avec hésitation et provisoirement pour une année, en accompagnant son vote d'aigres reproches, les subventions que le Comité des Finances demandait pour les corps littéraires.[1] La Convention frappa les grands coups. Elle défendit d'abord de pourvoir aux sièges vacants, et enfin, en août 1793, elle supprima "toutes les académies et sociétés littéraires patentées par la Nation."

On a souvent remarqué que cette même révolution qui avait supprime toutes les académies créa l'Institut, qui est une académie. Ce n'est pas versatilité dans les assemblées. La pensée de créer de toutes pièces une académie nouvelle était contemporaine de la résolution prise d'en finir avec les académies anciennes.

L'Assemblée constituante avait chargé Mirabeau de lui soumettre le plan d'une académie nationale. Mirabeau appela Chamfort qui était en querelle avec l'Académie française. Chamfort écrivit une violente diatribe et prépara un projet que Mirabeau n'eut pas le temps de lire à la tribune.

Les projets se multiplièrent sous la Convention. Condorcet, d'Alembert, Daunou, Talleyrand, tous ceux qui avaient le souci des grandes choses, apportèrent leur contribution. On dit que Talleyrand accepta la paternité d'un projet entièrement rédigé par l'abbé Desrenaudes, qu'il avait eu pour vicaire général à Autun et que nous avons connu membre du Conseil de l'Instruction publique. Talleyrand était de ceux qui peuvent se passer d'un secrétaire; mais la tradition est ancienne et persistante.

Tous les auteurs de projets ont réclamé à l'envi le titre glorieux de fondateurs de l'Institut. La vérité historique exige que l'on écrive un autre nom en tête de cette liste d'honneur, et ce nom est celui de Richelieu, fondateur de l'Académie française.

Nous sommes plus justes aujourd'hui que ne l'ont été nos pères. Notre admiration pour les grandes œuvres de la Révolution ne nous cache pas les gloires de la monarchie, qui sont les gloires de la France. Nous fêtons le centenaire de l'Institut de France, mais il ne nous en coûte pas d'associer à l'honneur de cette journée le fondateur ou les fondateurs des académies dont l'Institut a reçu l'héritage, Louis XIII et Louis XIV, Richelieu, Séguier, Colbert. L'Institut existe depuis le 25 octobre 1795; mais les académies qui le composent remontent à 1635. Assurément l'Institut de France, depuis sa fondation, compte dans ses rangs un nombre considérable d'hommes illustres. J'en veux citer quelques-uns, avec le regret de ne pas les citer tous: Chateaubriand, Lamartine, Victor Hugo, Alfred de Musset, Alfred de Vigny, Guizot, Cousin, Thiers pour l'Académie française; Monge, Berthollet, Lagrange, Laplace, Lavoisier, Fresnel, Ampère, Arago, Cuvier, Geoffroy Saint-Hilaire, Cauchy, Chasles, Claude Bernard pour l'Académie des Sciences; Daunou, Victor Le Clerc, Littré, Boissonade, Hase, Naudet, Burnouf pour l'Académie des Inscriptions; Louis David, Ingres, Delacroix, Meissonier, David (d'Angers) pour l'Académie des Beaux-Arts.

[1] Pour l'Académie française, 25,217 livres, plus 1,200 livres pour un prix à donner; pour l'Académie des Belles-Lettres, 43,908 livres; pour l'Académie des Sciences, 93,458 livres; ces deux Académies devaient aussi décerner chacune un prix de 1200 livres.

J'avais arrêté là cette liste de nos gloires contemporaines pour obéir à la loi qui m'est imposée de ne prononcer le nom d'aucun vivant; faut-il que je doive aujourd'hui ajouter le nom d'un homme que j'ai connu il y a plus de cinquante ans, à l'École normale où il était élève, où j'étais professeur, qui était notre ami à tous, car on ne pouvait le connaître sans l'aimer, et qui était avant tout l'ami et le bienfaiteur de l'humanité: le nom immortel de Louis Pasteur? Les voûtes de cette salle gardent l'écho des acclamations qui l'accueillirent quand il vint, à cette place même, recevoir les hommages du monde savant. L'humanité, ce jour là, fut reconnaissante et juste.

Ainsi l'Institut de France a eu, dès son premier siècle, une magnifique floraison de grands hommes. Nous sommes fiers de nos gloires nouvelles; mais nous gardons pour nos gloires séculaires un culte reconnaissant et filial. Nous ne renonçons ni à Corneille et Racine, ni à Boileau, ni à La Fontaine, ni à Bossuet, ni à Voltaire, ni à Montesquieu, ni à Buffon, ni à Clairaut, ni à d'Alembert, ni à Huyghens, ni à Mariotte, ni à Mabillon, ni à Rollin, ni à Turgot, ni à Lebrun, ni à Mignard, ni à Lesueur, ni à Philippe de Champagne, ni à Mansart, ni à Soufflot.

Messieurs, le drapeau aux trois couleurs est toujours pour nous "le drapeau chéri"; c'est l'astre de la liberté et de la civilisation; mais nous suivons avec amour et orgueil le drapeau blanc fleurdelisé remontant les âges jusqu'au siècle qui fut le grand siècle et qui reste par excellence le siècle français.

C'est le 29 janvier 1635 que l'Académie française reçut sa consécration officielle. L'Académie des Beaux-Arts eut le même honneur en 1648, l'Académie des Inscriptions en 1663 et l'Académie des Sciences en 1666.

Il ne suffit pas d'avoir restitué la création des académies à Louis XIII et à Richelieu, il faut remonter jusqu'à Conrart. La première en date, l'Académie française, est, comme beaucoup de grandes choses, due à l'initiative privée. Conrart n'était rien. Il n'est rien devenu. Il n'est célèbre que par son silence: un genre de célébrité créé tout exprès pour lui par Boileau. C'est lui qui eut l'idée de donner un règlement à une compagnie qui se réunissait tour à tour chez chacun de ses membres pour parler de littérature. Ils étaient neuf en le comptant. De petits hommes, dit Voltaire, d'un ton dédaigneux. Des hommes obscurs, dit-il ensuite en parlant des premiers académiciens au nombre de vingt-huit qui reçurent ce titre après les lettres royales de 1635. Sans doute on n'eut pas sur-le-champ un Corneille ou un Racine à introduire dans l'Académie. Il fallut attendre douze ans pour Corneille, trente-six ans pour Bossuet, trente-sept ans pour Racine, quarante-neuf ans pour La Fontaine et Boileau. L'assemblée se garnissait de grands hommes peu à peu. Elle ne devait jamais avoir quarante grands hommes. Aucune assemblée en aucun temps et chez aucun peuple ne pourra en avoir à la fois qu'un nombre très limité. Ceux que Voltaire appelle de petits hommes ne sont peut-être pas aussi petits qu'il le croit. Ils semblent petits à la postérité; ils étaient grands pour leurs contemporains. Apprenons, ne fût-ce que par prudence, à respecter les hommes d'élite qui ne sont ni des Voltaire ni des Molière. On ne peut pas, et on ne doit pas se tromper sur les hommes de génie; on peut hésiter sur le choix entre les hommes vraiment supérieurs sans être grands, ceux que j'appellerai les hommes distingués dans le genre médiocre.

C'est un honneur pour la société éclairée du XVII siècle d'avoir sur-le-champ attaché de l'importance à cette réunion de quelques hommes de goût, qui ne s'occupaient entre eux ni de religion ni de politique, et parlaient uniquement des lettres et des ouvrages de l'esprit. L'amour des lettres est resté un des caractères de notre génie national. Dès que le public fut admis aux réceptions de l'Académie française, il y courut. Quand elle ouvrit en 1702 ses portes aux femmes pour ces jours-là, les femmes affluèrent. L'Académie n'a eu garde de renoncer à cet usage qui a pris avec le temps plus de solennité. Une réception à l'Académie est, par excellence, un événement parisien. Il faut y avoir assisté; il faut avoir son avis sur les deux discours. On attache moins d'importance aux séances les plus passionnantes de la Chambre. La fameuse coupole est un instrument de torture; on y étouffe, on y perd connaissance. Ces femmes évanouies sont un accroissement de succès pour les deux orateurs. Elles font penser aux corridas espagnoles, qui ne sont admirables, au dire de leurs ennemis, que quand un toréador a été tué.

On parla de la société de Conrart au cardinal de Richelieu. Il avait l'instinct du grand et du stable. Il jugea que cette compagnie pouvait devenir une institution. Il offrit aux amis

de Conrart de reconnaître officiellement l'existence de leur association. Ce fut à peu près tout ce qu'il offrit; "des privilèges honorables, dit Voltaire, aucun d'utile, son fondateur ne lui ayant même pas procuré une salle d'assemblée."

En réalité, il ne rendait à l'Académie d'autre service que de ne pas l'ignorer, mais il pensa, et tout le monde pensa avec lui, que puisqu'il ne l'ignorait pas, il la gouvernait. Plusieurs des amis de Conrart hésitèrent. Ce qu'ils avaient cherché, c'était la liberté, on leur offrait l'assujettissement. Cette résistance ne pouvait durer; on ne résistait pas au roi, ni au cardinal, qui était le roi. Refuser une grâce qu'ils offraient, c'était plus que résister, c'était désobéir. On céda, on remercia. On exalta le roi et le grand ministre Richelieu qui promettait de protéger.

Il y eut une autre difficulté à la création officielle de l'Académie. Le Parlement aussi eut la velléité de résister. On sait que l'enregistrement était alors nécessaire pour donner efficacité aux décisions royales. Le Parlement pouvait retarder, il pouvait faire des observations et même des remontrances. A la fin, dans les grandes occasions, on avait raison de lui par un lit de justice. On n'alla pas jusqu'à ces extrémités pour la transformation des réunions de Conrart en Académie royale; mais le Parlement manifesta sa mauvaise humeur par un retard d'un an. Le cardinal fut obligé de faire entendre qu'il voulait être obéi.

On a cherché la cause de cette mauvaise volonté du Parlement. Il ne s'agissait pas de la création d'une cour souveraine, mais "de simples peseurs de syllabes et de jurés fabricateurs de mots," comme disaient les mauvais plaisants de l'époque.

Le Parlement, suivant Voltaire, craignit que l'Académie ne s'attribuât quelque juridiction sur la librairie, et ajouta cette clause aux lettres patentes du roi: "L'Académie ne connaîtra que de la langue française et des livres qu'elle aura faits ou qu'on exposera à son jugement."

Je crois plutôt que le Parlement craignait pour l'autorité qu'il s'attribuait en matière religieuse et philosophique. La question des académies touchait à la question des écoles. La théologie était tout près; plus l'autorité du Parlement était contestée en matière religieuse, plus il s'en montrait jaloux. Il obéissait dans toute cette affaire au même esprit qui inspira plus tard la réforme de l'Université par le président Rolland.

Le roi, et je parle ici de Louis XV autant que de Louis XIV et de Louis XIII, fut constamment pour les académies un bon maître, mais un maître. Les élections durent être soumises à son approbation; c'est un droit qui a toujours été conservé au pouvoir public; il existe encore aujourd'hui. Louis XIV l'exerça une fois dans une occasion très éclatante. Il voulait l'élection de Boileau; l'Académie élut La Fontaine. Le roi refusa son approbation. L'Académie s'empressa d'élire Boileau à la première vacance. "A présent, dit le roi, vous pouvez procéder à la réception de La Fontaine."

Le roi intervint aussi, mais bien rarement, dans les travaux de l'Académie. C'est lui, ou plutôt c'est Richelieu, auteur de la tragédie de *Mirame*, qui prescrivit cet examen du *Cid* inventé pour exalter la gloire du cardinal et dont le résultat fut de montrer dans tout son éclat la gloire de Corneille. Voltaire, au siècle suivant, sous prétexte d'impartialité et en mêlant l'apothéose à la critique, essaya la même entreprise et aboutit au même résultat.

Les académiciens, un moment détournés de leurs travaux plus paisibles, revinrent au Dictionnaire. On ne manqua pas sous la Révolution de leur reprocher de n'avoir fait ni la Grammaire, ni la Poétique que le roi attendait d'eux et d'avoir mené trop lentement le travail du Dictionnaire.

L'Académie n'était pas si coupable qu'on le croyait. Des trois objets confiés à ses soins, elle avait choisi le Dictionnaire, qui rendait à la langue le double service d'en fixer les termes et d'en expliquer les règles par des exemples empruntés aux meilleurs écrivains.

Le Dictionnaire avançait lentement. Cette lenteur fait sa force. Les variantes qu'il enregistre ont toutes été jugées et consacrées par le temps, avant de recevoir cette confirmation officielle.

Le Dictionnaire est à lui seul toute l'Académie française. A notre langue essentiellement souple et vivante, qui exprime avec facilité les passions et les idées à mesure qu'elles se renouvellent et qui suffit, sans néologismes, à l'exposition et à la démonstration des découvertes scientifiques, il donne la solidité et la majesté des deux langues qui ont successivement incarné la Grèce et Rome.

Louis XIV voulait qu'il y eût une langue de Louis XIV comme il y avait une langue de Périclès et une langue d'Auguste, et il revendiquait pour lui-même l'honneur de cette pensée lorsqu'il disait: "Le soin des Lettres et des Beaux-Arts ayant toujours contribué à la splendeur des États, le feu roi, notre très honoré seigneur et père, ordonna en 1635 l'établissement de l'Académie française pour porter la langue, l'éloquence et la poésie au point de perfection où elles sont enfin parvenues sous notre règne."

Je n'ai garde d'insister; je dis la pensée de Louis XIV et de ceux qu'on appelait dès lors les Quarante.

Notre admiration pour nos chefs-d'œuvre et notre langue ne nous empêche pas d'admirer la gloire des autres nations. Nous nous sommes associés au centenarie de Shakespeare; Gœthe, Schiller, Cervantès sont populaires dans nos écoles. Nul n'entrera jamais sans une respectueuse et solennelle émotion dans cette église de Santa-Croce à Florence où sont réunis, autour du cénotaphe du Dante, les tombeaux de Galilée, de Michel-Ange, de Machiavel, d'Alfieri, de Cherubini.

Le XVIII siècle reprochait toujours aux académies et surtout à l'Académie française, qui portait le poids des querelles parce qu'elle avait porté celui de la gloire et parce que le public pouvait plus facilement suivre ses travaux, d'avoir élu des hommes médiocres et d'avoir laissé en dehors d'elle des hommes de génie.

Je connais deux hommes de génie qui n'ont pas été de l'Académie française, Descartes et Molière. Rousseau, dont on prononce quelquefois le nom à propos des omissions de l'Académie, était citoyen de Genève.

Deux erreurs en un siècle et demi! Les hommes se trompent ordinairement plus que cela. La plupart des ouvrages de Descartes sont écrits en latin. Le *Discours de la Méthode*, qui est un des grands monuments de la langue française, n'était connu que d'un petit nombre de savants et de philosophes. Le grand éclat de la renommée de Descartes n'a commencé qu'après sa mort, quand on a enfin compris qu'il avait émancipé la raison humaine. Molière avait contre lui sa profession; on se rirait aujourd'hui, avec raison, d'un tel obstacle. C'était quelque chose sous Louis XIV. Messieurs les tapissiers valets de chambre du roi n'auraient plus voulu être de l'Académie. Je ne sais pas ce que Molière lui-même aurait pensé de son élection. On était alors conservateurs du rang comme on l'est aujourd'hui de la propriété. Il fallut contraindre Catinat à se laisser faire maréchal de France.

Quant aux autres grands hommes dont la Convention regrettait si amèrement l'absence, ils apartenaient à la catégorie de ceux que nous appelions tout à l'heure des hommes distingués dans le genre médiocre. Ils étaient admirés, à juste titre, par leurs contemporains; la postérité a le droit de choisir entre eux. Dufresny, Raynal, Helvétius sont des grands hommes dont on blâmait en 1793 l'omission, et dont on blâmerait aujourd'hui l'élection si l'Académie les avait élus.

De tous les griefs dirigés contre l'Académie, le plus fréquemment invoqué était sa courtisanerie envers le roi. C'était une compagnie de courtisans qui pouvait, en ce genre, donner des leçons à tous les Dangeau. N'est-ce pas elle qui avait mis au concours cette question: "Quelle est celle des vertus du roi qui mérite le plus d'être louée?"

On était bien loin de ce style et de ces sentiments lorsque Grégoire, reprochant au "bon Fénelon" d'avoir fait un traité sur la direction de la conscience d'un roi, ajoutait: "Comme si les rois avaient de la conscience! Autant eût valu disserter sur la douceur des bêtes fauves."

Le tort des hommes aveuglés par la passion est de vouloir toujours juger sans tenir compte des temps et des milieux. N'en déplaise aux niveleurs de 1793, l'esprit libéral qui s'était manifesté dans le sein de l'Académie au moment de sa création officielle subsista pendant toute sa durée. Il s'associait chez elle à une admiration pour le roi dont nous ne comprenons plus la nature. L'Académie voyait la France dans le roi. A cette époque de l'histoire, on n'était puissant qu'à condition d'être dépendant. Ce qui est indiscutable, c'est que les académies entourées d'honneurs par la monarchie étaient devenues peu à peu de véritables aristocraties. Elles avaient aux yeux des républicains le double défaut d'être des corporations, et des corporations privilégés, très entichées de leurs privilèges. Un usage introduit par Colbert, ou plutôt par l'abbé Bignon, son neveu et son représentant dans le gouvernement des sociétés savantes, divisait les Académies des Inscriptions, des Sciences et des Lettres en trois classes d'académiciens: les honoraires, les pensionnaires et les élèves; ce qui constituait un privilège

dans le privilège. Seule l'Académie française avait énergiquement refusé de subir l'affront de ce règlement.

L'Académie française avait toujours eu dans son sein, depuis sa création, des ducs, des maréchaux, des évêques, des magistrats de cours souveraines. Ces grands seigneurs apprenaient à traiter les gens de lettres comme des égaux ; mais, en même temps, les gens de lettres apprenaient à se croire grands seigneurs. Ils se donnaient des compliments les uns aux autres, pour s'exercer à leur fonction principale qui etait d'encenser le roi et le ministre. Les compliments sont devenus nos discours de réception ; Voltaire n'etait pas tendre pour eux : "Ce que j'entrevois dans ces beaux discours, dit-il, c'est que le récipiendaire ayant assuré que son prédécesseur était un très grand homme, que le cardinal de Richelieu était un très grand homme, le chancelier Séguier un assez grand homme, le directeur lui répond la même chose, et ajoute que le récipiendaire pourrait bien aussi être une espèce de grand homme, et que pour lui, directeur, il n'en quitte pas sa part" ; et plus loin : "La nécessité de parler, l'embarras de n'avoir rien à dire et l'envie d'avoir de l'esprit sont trois choses capables de rendre ridicule même le plus grand homme."

La Convention pouvait-elle souffrir l'existence d'un corps qui passait son temps à célébrer les vertus des rois, qui était lui-même un corps privilégié, et qui comptait dans son sein des membres investis d'un double privilège? C'était l'aristocratie de l'esprit, mais c'était une aristocratie. La Montagne et la Plaine étaient d'accord pour la renverser.

Il s'était pourtant passé vers le milieu du XVIII^e^ siècle un fait considérable qui aurait pu modifier les jugements des révolutionnaires. Voltaire était entré à l'Académie. Les académiciens s'étaient vaillamment défendus. Voltaire fut refusé deux fois. Enfin, il entra ; et dès ce jour l'Académie lui appartint. Il avait déjà son journal qui était l'*Encyclopédie*. L'*Encyclopédie* entra avec lui à l'Académie, qui fut ainsi transformée par anticipation en véritable Académie des Sciences morales et politiques. Il y fit nommer successivement Duclos, d'Alembert, Marmontel, Condillac, Morellet. Il échoua pour Diderot. Il s'en plaint vivement, et avec raison du reste, car si Diderot n'est pas précisément un génie académique, c'est sans conteste un homme supérieur. Voltaire écrit à l'abbé d'Olivet : "Tâchez, mon cher maître, de nous donner un véritable académicien à la place de l'abbé de Saint-Cyr et un savant à la place de l'abbé Salier. Pourquoi n'aurions-nous pas cette fois-ci M. Diderot? Vous savez qu'il ne faut pas que l'Académie soit un séminaire et qu'elle ne doit pas être la Cour des pairs. Quelques ornements d'or à notre lyre sont convenables ; mail il faut que les cordes soient à boyau et qu'elles soient sonores."

Voltaire n'était pas accoutumé aux échecs et avait pris sa revanche. Il avait le gros de son armée à l'Académie française, il avait à l'Académie des Sciences Condorcet, d'Alembert, Fontenelle. L'Académie des Inscriptions était plus résistante, mais il avait pénétré partout. Il était l'oracle des cercles de précieuses dont l'influence avait remplacé l'influence décroissante de la cour. Mme. de Lambert, Mme. de Tencin, Mme. Du Deffand, Mlle. de Lespinasse, Mme. Geoffrin, Mme. Du Châtelet recevaient ses inspirations. Il etait l'ami (intermittent) du roi de Prusse, le correspondant (et le flatteur) de la grande Catherine. Il avait traite Corneille de haut : il se croyait plus pathétique que Racine. En philosophie il tenait tête au clergé, tout en faisant ses pâques à Ferney et en dédiant au pape sa tragédie de *Mahomet*. Quand on le juge à présent, on ne peut s'empêcher de voir en lui un précurseur de la Révolution. Voltaire et toute l'armée qu'il commandait avaient, en effet, semé les idees révolutionnaires, mais ils avaient cru évoquer un génie ; et quand ils furent en face de lui (je parle des lieutenants de Voltaire, car il était mort en 1778), il leur sembla qu'ils avaient évoqué le diable.

Ils s'arrêtèreet en chemin, et devinrent, par cela même, les plus grands ennemis de leurs anciens amis. On pourrait ici parodier cette grande parole : "Il y a plus de joie dans le ciel pour un pécheur qui se repent. . . ." et dire : "Il y a plus de colère dans l'armée révolutionnaire pour un ami qui s'arrête en chemin . . ."

Les académies, dont on oublia les services, eurent le sort des parlements et du clergé. Grégoire, dans un rapport ridiculement emphatique, proposa la suppression des académies, tout en demandant que "du milieu des décombres, le sanctuaire des arts, s'elevant sous les auspices de la liberté, présentât la réunion organisée de tous les savants et de tous les moyens de science." "Après-demain, disait-il, la République française fera son entrée dans l'univers. En ce jour où le soleil n'eclairera qu'un peuple de frères, les regards ne doivent plus rencontrer sur le sol français d'institutions qui dérogent aux principes éternels que nous avons consacrés, et cependant quelques-unes, qui portent encore l'empreinte du despotisme ou dont l'organisation heurte l'égalité, avaient échappé à la règle générale : ce sont les academies."

Deux ans après avoir congédié les académies avec cette politesse, la Convention faisait une grande, une très grande chose. Elle les rétablissait, et en les rétablissant, elle leur faisait subir une modification profonde. Le rêve d'une assemblée unique des savants et des artistes, des poètes et des philosophes, déjà conçu par la Constituante, devenait une réalité. Jamais la fraternité des lettres, des sciences et des arts n'avait été affirmé avec cet éclat. La nouvelle institution réunissait en un faisceau toutes les forces de la passion et de la pensée. Elle créait au-dessus de la société vulgaire, occupée des soins de la vie, une sorte de monde à part d'où sortiraient sans cesse pour éclairer l'humanité, pour la fortifier et la charmer, des vérités et des chefs-d'œuvre. L'Institut ne participerait pas au gouvernement, il ne serait pas chargé de l'enseignement. Son action serait d'une nature plus haute ; elle s'exercerait par l'exemple. De même que le Dieu d'Aristote meut sans être mû et peut ignorer le monde auquel il donne la vie, il suffit aux savants et aux poètes d'être, et d'être connus. Leurs œuvres produisent le mouvement, et en même temps elles le réglent par l'admiration qu'elles inspirent.

Daunou parlant au nom de la Convention disait : "Nous avons emprunté de Talleyrand et de Condorcet le plan d'un Institut national, idée grande et majestueuse dont l'exécution doit effacer en splendeur toutes les académies des rois. . . . Ce sera en quelque sorte l'abrégé du mon de savant, le corps représentatif de la république des lettres, un temple national dont les portes toujours fermées à l'intrigue ne s'ouvriront qu'au bruit d'un juste renommée."

Cette union majestueuse et féconde de tout ce qu'il y a d'éternel dans le sentiment et la pensée n'est pas la seule grandeur de l'institution nouvelle. Les académies jusque-là avaient été purement locales. Elles se recrutaient dans une seule ville et représentaient le mouvement scientifique ou littéraire de la ville où elles étaient nées. Mais l'Institut créé en 1795 pour remplacer les académies n'est pas un institut parisien, c'est un institut national, c'est l'Institut de France. La constitution de l'an III, dont la formule est fidèlement reproduite par la constitution de l'an VIII, le déclare en ces termes solennels : "Il y a pour toute la République un Institut national chargé de recueillir les découvertes, de perfectionner les arts et les sciences."

Pourrais-je oublier, en présence de cette assemblée, que la Convention nationale ouvrit les portes de son Institut non seulement à tous les Français, mais à tous les grands hommes quelle que fût leur origine? De même que Louis XIV récompensait le génie à quelque nation qu'il appartînt, la Convention créa dans le sein de l'Institut l'ordre des associés étrangers, qui nous permet d'inscrire sur nos listes d'honneur Huyghens, Newton, Leibniz, et plus près de nous Rossini et Meyerbeer.

L'œuvre de la Convention n'est donc pas la reproduction des anciennes académies déguisées sous des noms nouveaux et modifiées dans les détails secondaires de leur organisation. C'est bien une œuvre nouvelle. C'est une création, une puissante création. C'est l'Académie de France, représentant à la fois les lettres, les sciences et les arts. Elle contient les anciennes académies, mais en les enfermant dans une synthèse nouvelle et forte. C'est notre droit et notre devoir, en ce jour de fête, d'adresser également nos hommages aux anciennes académies qui ont préparé l'Institut et à l'Institut qui contient et complète les anciennes académies.

L'œuvre de la Convention est assez belle pour que nous puissions avouer maintenant que l'Assemblée avait été moins heureuse dans les détails d'exécution que dans la conception première. Elle avait tout exagéré : sa propre autorité sur l'Institut et l'autorité de l'Institut sur les membres qui le composaient. Elle ne connaissait pas la liberté. Elle disait comme Louis XIV : "L'État, c'est moi," et quand elle avait usurpé tous les pouvoirs, elle disait : "Nous voilà libres."

La première faute de la Convention, en ceci comme en bien d'autres choses, fut son amour immodéré de la table rase. Elle avait supprimé les académies qu'elle pouvait modifier en les conservant. Elle supprima jusqu'à leurs noms dans la réorganisation qu'elle fit ensuite. On a dit d'elle avec vérité qu'elle avait

peur des mots. Elle remplaça ces noms illustres par les appellations vulgaires de première, seconde, troisième classe, et ne réussit par ces changements qu'à voiler les traditions historiques. Elle effaça un autre nom qui aurait dû lui être particulièrement sacré. Ayant à placer la philosophie dans la classe des sciences morales et politiques qu'elle organisait pour la première fois, elle remplaça ce nom, qui pouvait rappeler les croyances spiritualistes, par celui d'Analyse des sensations et des idées, qui ne rappelait que Condillac. Chaptal, qui déjà en 1801 reprochait à l'organisation de l'Institut "de s'être beaucoup trop écartée de ce que l'expérience avait montré de perfection dans la composition de nos anciennes académies," fit en 1803 un nouveau projet où il se montra plus équitable et plus habile que la Convention. Il proposait même de rétablir le nom des anciennes académies, dont la France s'honorait depuis plus d'un siècle, et qui étaient devenues le modèle des institutions savantes et littéraires formées successivement dans tous les États de l'Europe. Le Conseil d'État ne voulut pas y consentir. Il approuva le fond de la proposition, mais il ne rendit pas leurs noms aux anciennes compagnies.

L'Académie des Sciences morales et politiques, fondée pour la première fois en 1795, et qui formait la seconde de l'Institut, eut une courte existence. Le Premier Consul avait dit un jour à M de Ségur : "Vous présidez la seconde classe de l'Institut ; je vous ordonne de lui dire que je ne veux pas qu'on parle de politique dans les séances. Si la classe désobéit, je la casserai comme un mauvais club." Fidèle jusqu'au bout à son aversion pour ceux qui'il appelait les idéologues, quand il procéda à la réorganisation de l'Institut en 1803, il supprima la deuxième classe par prétérition, en supprimant son nom et en répartissant ses membres dans les autres classes.

La première faute de la Convention fut donc de renoncer à des noms vénérables et à un passé illustre ; elle fit une seconde faut dans le mode d'élection qu'elle adopta. Les candidats furent présentés par la classe dans laquelle s'ouvrait une vacance, et l'Institut en corps fut chargé de choisir entre les candidats ainsi présentés. Jamais la compétence ne fut traitée avec un pareil mépris. Un comédien décidait de l'élection d'un mathématicien. Un peintre jugeait un philosophe. On reconnaît bien là une assemblée qui admettait les juifs au nombre des votants pour l'élection des évêques catholiques. L'élection par classe ou académie ne fut établie qu'en l'an XI, sur le rapport de Chaptal.

La Convention commit une troisième faute. Les deux premières avaient pour effet d'exagérer l'unité ; celle-ci exagérait et faussait le caractère national de l'Institut. C'était l'Institut de France ; on voulut qu'à ce titre il fût composé par moitié de Parisiens et de provinciaux. Il aurait suffi de dire que les choix pouvaient se porter également sur les hommes du premier mérite, qu'ils eussent leur résidence à Paris ou ailleurs. Non. Il sembla plus radical de partager par moitié. Cela cessait même d'être juste, car Paris ne comptait que 500,000 habitants et la province en avait 25 millions. Et cela n'était pas raisonnable ; car un homme d'élite peut désirer le séjour de Paris à cause des bibliothèques, des musées, des amphithéâtres et de tous les autres moyens d'étude. On avait admis une section de l'art dramatique : trois comédiens parisiens, trois comédiens de province. Tout le monde sait que les grands comédiens peuvent se former en province, mais qu'ils ne peuvent y rester. Ils n'y trouvent ni les traditions, ni les écoles, ni les auxiliaires, ni le public dont ils ont besoin, ni les ressources matérielles. On en peut dire autant des érudits, des artistes. La règle de résidence était sévère alors ; plus sévère qu'elle ne l'a été depuis. Un membre nommé pour représenter Paris et qui s'établissait définitivement en province était obligé de donner sa démission. Destutt de Tracy, qui habitait Auteuil, fut nommé membre non résident.

La plus grande erreur commise est peut-être le règlement intérieur des travaux imposé par décret organique.

Le gouvernement s'attribuait dans ce règlement le droit de requérir l'avis des classes de l'Institut. C'est surtout à l'Academie des Sciences qu'il adressa ses réquisitions. Il la consulta sur les voitures couvertes destinées au transport des malades, sur le perfectionnement à apporter au régime des hôpitaux, sur le système monétaire, sur la manière d'accorder l'ère de la République avec l'ère vulgaire, sur un nouveau boulet, sur un taffetas huilé propre à faire des manteaux pour les troupes, sur l'idée de fair établir plusieurs rangées de canons sur un seul affût, sur la conservation des eaux potables à bord des navires, sur la conservation des biscuits et des légumes en mer. Il y avait aussi des questions pour les autres classes, même des questions philosophiques, ce qui tendait à faire une doctrine d'État. Rien n'est plus contraire à la philosophie et à la vraie politique, et rien ne peut nuire davantage aux progrès de la science et à l'éclat des académies. Dans un corps littéraire bien organisé, l'autorité de chaque membre s'accroît de celle de la compagnie, mais a condidition qu'il n'en résulte aucune ingérence de l'académie ni des gouvernements sur le travail individuel. Quand le général Cavaignac, pour réfuter les socialistes de 1848, demanda a l'Académie des Sciences morales et politiques des petits livres populaires, l'Académie échoua, il faut le dire résolument, quoiqu'elle se fût adressée aux plus grands noms de la science. Un grand esprit ne se retrouve pas dans un travail fait sur commande : il faut au génie l'air de la liberté.

Ce droit de réquisition n'était pas seulement attribué au gouvernement, il appartenait aussi au public. Tout auteur pouvait exiger une analyse de son livre, tout inventeur un examen de sa découverte. Ainsi les académiciens n'étaient plus maîtres de leur temps. Je ne m'étonne plus qu'on leur eût attribué deux costumes : un costume de cérémonie et un costume de travail. On ne voyait pas qu'assujettis au service de tout le monde, il ne leur restait plus de temps pour le service de la science.

Je ne veux pas tout énumérer. Je citerai pourtant la suppression des secrétaires perpétuels, remplacés par deux secrétaires semestriels : c'était ôter aux académies leur unité, leur vie. Chaptal, en 1801, parlant des anciennes académies, disait : "Le même homme suivait tous les détails de l'Académie, en devenait l'historien, et attachait d'une manière toute particulière la gloire de son nom à celle du corps dont il était l'organe ; il y avait plus de suite dans l'administration, plus de célérité dans l'exécution, plus d'ordre dans la marche, et on ne peut pas nier que le rétablissement d'un secrétaire perpétuel pour chaque classe de l'Institut, en rouvrant une carrière qui présente tant de grands hommes pour modèles, ne contribuât à la gloire de ce corps et aux progrès des sciences." Et plus tard, en 1803, il revenait à la charge - "Le rétablissement de ces places, disait-il en parlant des secrétaires perpétuels, fera renaître une branche d'éloquence très négligée depuis dix ans et donnera aux travaux académiques cet esprit de suite, cet enchaînement de faits et de pensées qui, seuls, peuvent fixer l'époque des découvertes et tracer avec exactitude l'histoire des connaissances humaines."

Tout en déclarant qu'elle renonçait au passé académique, la Convention, par la force même des choses, avait conservé à son Institut tous les avantages dont avaient joui les anciennes académies. Elle maintenait la reconnaissance de l'Institut par l'État et l'intervention de l'État dans les règlements intérieurs de l'Institut. Elle laissait à l'Institut le local des académies, la bibliothèque, la participation à la nomination des professeurs dans les grands établissements littéraires et scientifiques. L'Institut a conservé cette prérogative et présente encore aujourd'hui des candidats pour le Collège de France, le Muséum, l'Académie, de Rome, les Écoles de Rome et d'Athènes, l'École des Chartes, l'École des Langues orientales vivantes, le Conservatoire des Arts et Métiers, l'Observatoire, l'École Polytechnique. Il a conservé les impressions gratuites et les prix connus sous le nom de prix du budget, auxquels s'ajoutent à présent des prix fondés par l'initiative privée, dont le chiffre annuel n'est pas inférieur à 524,500 francs. Le 29 messidor an IV la Convention donnait aux membres de l'Institut une indemnité annuelle de 750 myriagrammes de froment, et le 19 thermidor suivant, elle décidait que "sur cette indemnité, il serait distrait à l'égard de chacun des membres une somme égale à la valeur de 150 myriagrammes de froment, pour être répartie par forme de droit de présence entre les assistants aux séances, tant générales que particulières, de chaque classe."

En 1803, sur le rapport de Chaptal, on permit aux membres de l'Institut d'être de plusieurs académies à la fois, et par conséquent de réunir plusieurs indemnités. "C'est, dit Chaptal, le moyen d'ouvrir aux hommes distingués plusieurs routes à la gloire et à l'aisance, et par conséquent le moyen de multiplier et d'agrandir les talents."

Le droit de cumuler les académies subsiste, mais on a enlevé celui de cumuler les indemnités. Nous en sommes restés aux 750 myriagrammes. Ceux d'entre nous qui font partie de plusieurs académies ne touchent l'indemnité qu'une seule fois. Nous nous vantons de n'être pas riches.

Les membres de l'Institut, quand on fixait à 750 myriagrammes de froment, c'est-à-dire, pour parler en langage intelligible, à 1500 francs, l'indemnité qui devait les délivrer de

tous les soucis de la vie, n'imaginaient pas dans leurs rêves les plus ambitieux qu'ils auraient un jour à eux l'un des plus beaux palais du monde, avec une galerie de tableaux, une bibliothèque créée d'une seule venue par un grand écrivain doublé d'un érudit consommé, des bois, des eaux, et tout un monde de beaux souvenirs.

Peut-être est-il bon de rappeler ici, pour expliquer à la fois notre richesse et notre pauvreté, que tous les dons faits à l'Institut sont faits à la science ou aux pauvres. Les membres de l'Institut n'en profitent jamais. Une nouvelle donation n'est pour eux qu'un surcroît de travail. L'empereur Napoléon III voulut un jour élever à 5000 francs l'indemnité annuelle de 1500 francs, ce qui faisait une quantité froment fort respectable. L'Institut, consulté, exprima sa reconnaissance, et refusa.

On a dit quelquefois que tous les efforts de la Révolution pour transformer les académies n'avaient été qu'une illusion. Le 8 août 1793, on les supprime ; le 25 octobre 1795, on les remplace par l'Institut. On s'aperçoit sur-le-champ que cet Institut, à force d'être nouveau, n'est pas viable. Dès 1803 on commence à le réformer ; les réformes se multiplient d'année en année, et à quoi aboutissent-elles ? à supprimer la plupart des innovations à refaire les anciennes académies et même, en 1816, à leur rendre leur nom.

Ceux qui parlent ainsi ne voient pas qu'il reste à la Révolution la gloire d'avoir établi un lien étroit entre les académies, d'avoir compris la solidarité des lettres, des sciences et des arts, d'avoir mis les académies en communication plus intime avec le public et de leur avoir donné de nouveaux et sérieux moyens d'influence.

Des anciennes compagnies, des remaniements opérés sur les nouvelles est résulté l'Institut actuel, où la protection de l'État n'exclut pas la liberté des membres, où chacun répond seul de sa doctrine, où la solidarité d'honneur qui unit tous les membres rend impossibles les excentricités, où tous les travaux tendent à la manifestation de la vérité et aux triomphes de l'art, où tous les membres rassemblés sans être confondus se prêtent une mutuelle assistance sans jamais tomber dans la confusion ; un corps enfin qui réunit dans une juste proportion l'autorité et la liberté, et qui mérite d'être proposé comme modèle à toutes les nations civilisées.

J'ose ajouter, Messieurs, que votre présence ici, celle du chef respecté de l'État, et l'éclat qui en résulte vont donner à l'Institut national de France une consécration nouvelle.

Le monde assiste depuis vingt-cinq ans à un singulier spectacle. D'une part les gouvernements multiplient avec une sorte de rage les préparatifs de guerre. Ils construisent des forteresses, ils coulent des canons, ils emplissent les arsenaux de projectiles ; ils imposent le service militaire dans l'armée active à tous les jeunes gens sans exception, au point de vider les écoles, de désorganiser les services publics et particuliers, d'ôter à l'agriculture et à l'industrie les bras dont elles ont besoin. Ils retiennent les citoyens dans les liens du service militaire jusqu'à quarante-cinq ans. Il semble que la bataille doive se livrer demain.

En même temps tous les philosophes, tous les publicistes, les hommes d'État, les souverains eux-mêmes protestent à grands cris de leur horreur pour la guerre. Ils veulent la paix, il la leur faut pour rendre au travail la sécurité, à l'intelligence ses droits et à l'année son printemps. On fonde de toutes parts des ligues pour la paix, on assemble des congrès pour protester contre la paix armée, plus ruineuse et plus meurtrière que la guerre.

Hélas ! ces congrès n'apportent que des vœux. C'est beaucoup et ce n'est rien. Ils apportent des vœux, je n'ose pas dire qu'ils apportent des espérances.

Ce qu'il faut à l'humanité, ce ne sont pas des paroles, ce ne sont pas des soupirs, ce sont des actes. Ce qui fera renaître la fraternité entre les hommes, ce sont grands travaux faits en commun, de grand services rendus à l'humanité.

Le voilà devant vos yeux, le congrès de la paix ! Voilà le congrès où la vérité est aimée pour elle-même, quel que soit le pays où elle éclate, où la poésie est adorée dans toutes les langues, où les grandes découvertes excitent le même enthousiasme, quelle que soit leur origine, et où l'on ne connaît d'autre émulation que celle de bien faire. La patrie de l'éternelle vérité et de l'éternelle beauté est aussi la patrie de la paix.

Associés et correspondants de l'Institut de France, vous n'emporterez pas seulement d'ici le souvenir des chaleureuses sympathies qui vous ont accueillis. Nous emporterons tous, de cette réunion fraternelle, un redoublement d'amour pour la paix, pour les sciences qui la fécondent et pour les arts qui l'embellissent ; et nous travaillerons, chacun dans notre coin préféré de l'atelier universel, à la prospérité de la maison, c'est-à-dire au bonheur de l'humanité.

"BARISÀL GUNS" AND "MIST POUFFERS."[2]

IN the delta of the Ganges, dull sounds, more or less resembling distant artillery, are often heard. These are called "Barisàl guns"; but I do not know the meaning of the term.[1] The object of this note is to draw the attention of the readers of NATURE to this mysterious phenomenon, and to the similar "mist pouffers" of the Belgian coast.

My attention was for the first time drawn to the subject some days ago by a letter from M. van der Broeck, Conservator of the Museum of Natural History of Belgium. He writes[2] of certain "curious aerial or subterranean detonations, which are pretty commonly heard, at least, in Belgium and in the north of France, and which are doubtless a general phenomenon, although little known, because most people wrongly imagine it to be the sound of distant artillery.

"I have constantly noticed these sounds in the plain of Limburg since 1880, and my colleague of the Geological Survey, M. Rutot, has heard them very frequently along the Belgian coast, where our sailors call them 'mist pouffers' or fog dissipators.

"The keeper of the lighthouse at Ostend has heard these noises for several years past; they are known near Boulogne, and the late M. Houzeau spoke of them to my friend M. Lancaster. More than ten of my personal acquaintances have observed the fact.

"The detonations are dull and distant, and are repeated a dozen times or more at irregular intervals. They are usually heard in the day-time when the sky is clear, and especially towards evening after a very hot day. The noise does not at all resemble artillery, blasting in mines, or the growling of distant thunder."

M. van der Broeck, after referring to the "Barisàl guns," says that he was disposed to regard the noises as due to some peculiar kind of discharge of atmospheric electricity. "But my colleague M. Rutot believes the origin to be internal to the earth. He compares the noise to the shock which the internal fluid mass might give to the earth's crust."

Mr. Clement Reed has informed M. van der Broeck that he believes similar noises are heard on Dartmoor, and in some parts of Scotland. I was not previously aware of anything of the kind in these islands.

Before any systematic observations are undertaken, it will be useful to form some general idea of the frequency of these sounds and of their geographical distribution.

Will any of the numerous readers of NATURE in various parts of the world give us an account of their experiences in this matter? G. H. DARWIN.

NOTES.

THE Municipal Council of Paris have decided to erect a statue to Sir Isaac Newton. We cannot imagine the London County Council paying a similar graceful tribute to the greatness of one of France's renowned investigators, say Laplace or Lavoisier, but we dare to suggest that the action of the Paris Municipality ought to be reciprocated.

MUNIFICENT gifts to science and education continue to be reported from America. *Science* states that the Spring Garden Institute of Philadelphia has received £20,000 from the heirs of Samuel Jeanes, who supported the Institute with great generosity during his lifetime; Earlham College at Richmond, U.S., has

[1] T. D. La Touche, Brit. Assoc. Rep. 1890, p. 800.
[2] I give a free translation and abridgement of the letter.

received £5000 from Mr. M. H. White and Mr. F. T. White, in memory of their father; a new laboratory, built at a cost of £8000, is almost completed for the departments of bacteriology, histology, and pharmacy in the Medical College of the University of Minnesota; and by the will of Colonel W. L. Chase, £1000 is bequeathed to Harvard College to establish a scholarship in the medical school.

DURING the recent Zoological Congress, at one of the meetings of the Section of Comparative Anatomy and Embryology, Prof. A. Kovalewsky bore testimony to the greatness of Huxley in words of which the following is a translation:—"In the list of men of science who expressed their intention to take part in our Congress will be found the name of Thomas Huxley; but death has prevented him from being among us. In the person of Huxley, science has sustained a great loss. We do not know any other investigators of our century who had the talent of foresight to such an extent as Huxley. It was he who, properly speaking, founded modern embryology by demonstrating the homology of the germinal layers of Vertebrates with the ectoderm and endoderm of Cœlenterates. It was he who supported Darwin in the publication of the fundamental work on the origin of species, and it was he who was the fervent propagator of the views therein contained. The two names of Darwin and Huxley have built up the story of the scientific world."

THE following gentlemen have been recommended for election as the Council and officers of the London Mathematical Society at the annual meeting to be held on November 14:—President, Major P. A. Macmahon, F.R.S.; Vice-Presidents, Prof. M. J. M. Hill, F.R.S., M. Jenkins, A. B. Kempe, F.R.S.; Treasurer, Dr. J. Larmor, F.R.S.; Secretaries, R. Tucker and A. E. H. Love, F.R.S. Other members—H. F. Baker, G. H. Bryan, F.R.S., Lieut.-Colonel A. J. Cunningham, Prof. Elliott, F.R.S., Dr. Glaisher, F.R.S., Prof. Greenhill, F.R.S., Dr. Hobson, F.R.S., Prof. W. H. H. Hudson, and F. S. Macaulay. It will be seen that Mr. Jenkins, after thirty years' service, has retired from the office of Secretary, on the score of his delicate state of health. The Society held its first meeting on January 16, 1865, and on the retirement of Mr. H. M. Bompas (November 20, 1865), Mr. Jenkins was requested to act as Secretary until the annual general meeting (January 15, 1866), when he and the late G. C. de Morgan were elected joint Secretaries.

NEXT Sunday will be Museum Sunday—the fourth arranged by the Sunday Society. On that day special sermons or discourses will be given by many leading men in London and the provinces, in support of the Society's object, viz. the opening of museums, art galleries, libraries, and gardens on Sundays. The cause is a righteous one, and deserves every support. A number of special exhibitions will be held in the afternoon of Sunday, and these, together with the museums and other places of interest which will be open, make a fairly extensive list of institutions opened in the manner advocated by the Society. The list clearly indicates that the public opinion of the country is really on the side of a rational observance of the weekly day of rest.

THE death is announced of Prof. H. Hellriegel, in his sixty-fourth year. His investigations in the domain of agricultural science produced many valuable results, and it was his researches that led to the discovery of the fixation of free nitrogen by leguminous plants, through the medium of micro-organisms in the root nodules.

THE death of Dr. Robert Brown deprives science of one of her most popular exponents. Dr. Brown was born at Campster, Caithness, in 1842. He studied in the University of Edinburgh, and afterwards in the Universities of Leyden, Copenhagen, and Rostock, receiving from the latter the degree of Doctor of Philosophy. In 1861 he visited Spitzbergen, Greenland, and the western shores of Baffin's Bay, and made a number of valuable observations. Between 1863-66 he travelled for scientific purposes in many of the least-known parts of America, and some of the Pacific Islands, from the West Indies and Venezuela to Alaska and Behring Sea Coast, as botanist of the British Columbia Expedition and commander of the Vancouver Island Exploring Expedition, during which he introduced various new plants into Europe, and charted all the interior of Vancouver, then unknown. In 1867 he visited Greenland, making, with Mr. E. Whymper, the first attempt by Englishmen to penetrate the inland ice, and formed those theoretical conclusions regarding its nature, afterwards confirmed by Nansen and Peary. Dr. Brown afterwards travelled extensively in the Barbary States of North Africa. Settling down in Scotland he was successively lecturer on geology, botany, and zoology in the Royal High School, Edinburgh, and Heriot Watt College, Edinburgh, the Mechanics' Institution, Glasgow, and elsewhere. He was an honorary or ordinary member of many learned societies in this country, in America, and on the continent. In 1876 he removed to London, in order to devote himself entirely to literary work, and for the greater part of the period, from that time to his death, was on the editorial staff of the *Standard*. He was the author, or part author, of about thirty volumes, and of a large number of scientific memoirs, articles, and reviews.

THE thirty-fourth annual meeting of the Yorkshire Naturalists Union was held yesterday at York Museum, and the presidential address was delivered by Dr. R. Braithwaite, on "The Study of Mosses."

MR. ARCHIBALD DENNY, of Dumbarton, has accepted the presidency of the Institution of Junior Engineers, in succession to Mr. Alexander Siemens, and will deliver his presidential address on Friday evening, November 1, at the Westminster Palace Hotel; Prof. A. B. W. Kennedy, Past-President, in the chair.

THE Epping Forest Free Local Museum, established by the Essex Field Club in Queen Elizabeth's Lodge, Chingford, will be declared open next Saturday afternoon, by Mr. R. C. Halse, Chairman of the Epping Forest Committee of the Corporation of London. Short addresses on the subject of local museums will be given by Mr. A. Smith Woodward, and others.

THE Session 1895-96 of the Royal Geographical Society, for the evening meetings, will commence on November 11, when an account of the progress of the Jackson-Harmsworth Arctic Expedition will be given by Mr. A. Montefiore. On November 25, a paper on the Færoe Islands will be read by Dr. Karl Grossmann; exploration in the Central Alps of Japan will be described by the Rev. Walter Weston on December 9; and movements of the earth's crust, by Prof. John Milne, F.R.S., on January 6. Other papers which may be expected after Christmas are the following: Journey across Tibet, by St. George R. Littledale; exploration in the Alps of New Zealand, by E. A. Fitzgerald; our knowledge of the oceans, by Dr. John Murray; the geography of the English lake district, by J. E. Marr, F.R.S.; the cañons of Southern Italy, by R. S. Günther; British Central Africa, its geography and resources, by Alfred Sharpe. The following subjects, among others, will be submitted for consideration and discussion at the special afternoon meetings:—The construction and uses of globes, by J. Y. Buchanan, F.R.S.; the struggle for life in the North Polar region, by A. Trevor-Battye; an attempt to reconstruct the maps of Herodotus, by J. L. Myres. Under the joint auspices of the Society and the London University Extension, Mr. H. J. Mackinder is giving a course of twenty lectures on the principles of geography, at Gresham College.

THE *Weekly Weather Report* of the 26th inst. shows that the temperature over the British Islands during the week was abnormally low for the time of year, the deficit ranging from 4° in the Channel Islands, and 6° in the east of England and north of Ireland, to 8° in the north-west of England and the south of Ireland. The lowest shade readings were recorded towards the end of the week, and ranged from 18° in the south-west of England to 21° in the south of England and 22° in the Midland counties. The continuous occurrence of frost for several nights in the neighbourhood of London during the current month of October has exceeded any previous record in that month at Greenwich during the last fifty years.

A DESCRIPTION of a luminous cloud, observed at Mojanga, Madagascar, on September 27, by Mr. Stratton C. Knott, H.M. Vice-Consul, has been forwarded to us by Mr. R. H. Scott, F.R.S. The phenomenon was seen at 8.20 p.m. as a narrow streak of what appeared more like mist than cloud. It came out of a cumulus cloud in the south, a few degrees above the horizon, and extended through the tail of Scorpio across two-thirds of the sky, which was quite clear excepting some cumulus on the southern and eastern horizon. The streak travelled at a rapid rate eastwards, but its base seemed to be stationary; as it crossed the moon, it caused a sort of double corona. As the cloud got lower on the eastern horizon, although always maintaining the same length, some cumulus passed under it, partly obscuring it, and a few minutes later the streak was lost altogether in the cumulus on the eastern horizon. At the time of the observations the weather was perfectly calm, but soon after this streak had passed, cumulus commenced to ascend from the eastward, and the sky soon became nearly overcast.

THE polarisation of the light emitted by incandescent bodies has not yet been fully investigated. Arago, indeed, made some experiments on incandescent iron, platinum, and glass, but these were only qualitative, and did not extend to liquids. Mr. R. A. Millikan publishes, in the *Physical Review*, an account of some careful tests of light emitted by glowing solids and liquids with a view to discover the laws of its polarisation. This phenomenon is exhibited strongly by incandescent platinum, silver, and gold, and by molten iron and bronze. A somewhat feebler polarisation is shown by copper, brass, lead, zinc, and solid iron. The most significant result is that polarisation is minimum with rays emitted normally to the surface, and maximum at a grazing emission. This indicates that the vibrations take place in a plane at right angles to the emitting surface. To show the phenomenon at its best, a smooth surface is essential. Glass and porcelain also emit polarised light, but to a lesser amount. Fluorescent bodies do the same, so that evidently a high temperature is not necessary. In the case of uranium glass it is the green reflected light which is polarised, and not the blue incident light diffused from the surface.

THE main facts of Lieut. Peary's work in North Greenland are described by Prof. R. D. Salisbury in *Science* of October 11. Prof. Salisbury was one of the party which relieved Lieut. Peary, the other members being Mr. Émil Diebitsch, Dr. J. E. Walsh, Mr. T. Boutillier, and Prof. L. L. Dyche. During his Arctic residence, Lieut. Peary mapped a considerable stretch of the coast of West Greenland—from Cape Alexander on the north to Cape York on the south—and his results show a number of remarkable differences with earlier charts of the same region. His map locates the positions of nearly one hundred glaciers, where but ten were represented on the published chart. In addition to the map, Mr. Peary kept a series of meteorological records, and made observations of the behaviour of winds about the ice sheet, and in this way has come into possession of facts which are not without significance in connection with the problems of glaciology. He made careful measurements of the rate of motion of one of the most active glaciers of the region, and carried them through a sufficiently long period of time to give them especial value. He took back to the United States two large and choice meteorites from the coast east of Cape York, and these will undoubtedly prove of interest. His studies of the Eskimos of North Greenland will, when published, form an important contribution to ethnology.

So far as concerns the results accomplished by the members of the Peary relief party of this year, Prof. Dyche was successful in getting large numbers of birds and mammals at various points along the coast. He also secured an abundant supply of walruses, reindeer and seals, and a smaller number of narwhals, and saw much of the west coast of Greenland between latitude 64° and 78° 45′, at close enough range to study its geographic features to advantage. Stops were made near the parallels of 67°, 69°, 70°, and at many points between 75° 45′ and 77° 45′. At all these points geographical and geological studies were carried on. The eastern coast of America was also seen for a considerable distance, especially from Ellesmere Land south to 71° 30′, and most of the coast of the island of Disco. Prof. Salisbury, who accompanied the party in order to study glacial geology, observed in detail many glaciers between 75° 45′ and 77° 45′ on the Greenland coast, and made some determinations of significance concerning glacier motion. A considerable body of evidence was gathered touching the former extension of the ice cap of Greenland. Determinations were also made at several points concerning recent changes of level of the land.

A RECENT number of the *Pioneer Mail*, published in Allahabad, contains an interesting article on immunity from scorpion and snake venom. Much attention has been directed in India to the experiments, which have lately been so successfully carried out, on immunity to snake-bites artificially induced by the introduction of gradually increasing doses of the venom into the system. The writer of the article in question does not regard this achievement as any really new discovery, being convinced that the traditional immunity claimed to be possessed by the Indian snake-charmers is simply due to the fact that they have frequently been accidentally bitten by cobras and karits, and having survived the first attack experienced no evil effects from the subsequent bites. This he states as the result of his personal acquaintance with many Madari Jogis and Fakirs, some of whom he knew had been bitten as many as five times. It appears, however, that cases of reputed immunity to scorpion stings are also well known, and one of these he had the opportunity of himself carefully testing. Hearing of a Mahomedan Fakir who had established a reputation for himself in this respect, he determined to investigate the case, and banish, if possible, all chance of trickery and deception being practised. He therefore dug up the scorpions himself, and these formidable creatures he describes as being from 5 to 7 inches long, with claws on them like lobsters. These scorpions the Fakir was told to irritate (not by pinching the end of the tail, which is a well-known way of preventing their stinging), but by touching them on the part of the body indicated; the result was that each one of them stung him strongly enough to draw blood, but the man was apparently none the worse. "There could be no doubt," he writes, "as to the perfect genuineness of the exhibition." This incident should encourage M. Calmette to continue his experiments on artificially inducing immunity to the sting of scorpions by means of gradual doses of the scorpion venom. It is to be hoped that the successful investigations which have so far been made on artificially procuring immunity to snake-bites, may obtain the official recognition which they deserve, and that such immunity may not in the future be confined to the selected few or so-called charmed individuals.

IN a lecture recently delivered by Dr. W. J. van Bebber, at Lubeck, and printed in the *Annalen der Hydrographie und Maritimen Meteorologie* for September, he discusses the possible means of improving storm-warning signals. As Dr. v. Bebber has charge of the weather service at the Deutsche Seewarte, his views on the subject carry considerable weight. He points out that notwithstanding constant exertions to place weather prediction on a sound and trustworthy basis, the solution of the question remains in a somewhat unsatisfactory condition. He makes the following suggestions for the furtherance of the object in view, most, if not all, of which have already been discussed at various mereorological conferences, and have fallen through on the score of expense or other hitherto insuperable difficulty:—(1) Extension of telegraphic communication westward (Färoe, South Greenland, &c.). This proposal was advocated by the late Captain Hoffmeyer. (2) Acceleration of exchange of telegrams, by the introduction of the "circuit-system." By this means the telegrams in America are received, and warning messages despatched within two hours of the time of taking observations. (3) More frequent information, by means of telemeteorography, or the connection of self-recording instruments with central offices. The practicability of this method has been put to test in the Netherlands, and the subject was recently discussed by the International Meteorological Committee at Upsala. (4) Exchange of telegrams between neighbouring signal stations; this plan has been found to work successfully in Germany and America, and by its means more recent information is obtained by the seafaring community as to the sudden approach of stormy weather. (5) The popularisation of weather knowledge among the public by means of weather charts, and (6) the preparation of an atlas of types of weather. The number of charts required would be at least 500 or 600. This subject has been suggested by Mr. Abercromby and others.

A NEW method of measuring the resistance of an air-gap during the passage of a spark has been devised by M. Victor Biernacki, and is described in the current number of the *Journal de Physique*. In the case of a Hertzian resonator in unison with an exciter, the forced vibrations and the natural vibrations of the resonator (the presence of which, according to Poincaré and Bjerkness, explain multiple resonance) have the same periodic time, and according to Bjerkness's theory these two vibrations are in oppose phase. In order that these two vibrations may entirely destroy each other, it is necessary that they be equally damped—that is to say, that the resistance of the exciter and resonator should be equal. The author has verified this consequence of the real presence of these two sets of vibrations in the resonator, by steadily increasing the resistance of the resonator, starting with a resistance less than that of the exciter. In this way he has succeeded in entirely destroying the vibrations in the resonator, and according to theory at this moment the resistances of the exciter and resonator must be equal. Since these had the same dimensions, and were made of the same material, but the spark-gap in the exciter was replaced by a liquid resistance R, it follows that the value of R, which corresponds to the completed extinction of all vibrations in the resonator, is equal to the resistance of the spark-gap in the exciter. The resistance R consists of a glass tube filled with a solution of copper sulphate of various strengths. A Geissler tube or a bolometer is employed to indicate the presence of the vibrations in the resonator. As the dilution of the sulphate of copper solution is increased, the vibrations in the resonator decrease in intensity. These die out, and on further dilution reappear. For a spark-gap of 1 cm. the resistance R varied between 300 and 800 C.G.S. units. With a spark-gap 0·4 m.m. long, however, the resistance is found to be between 1200 and 1500 C.G.S. units. This increase of the resistance as the spark diminishes is very curious; but it is important to notice that the decrease in the length of the spark is accompanied by a change in other properties of the spark. When the terminals of the spark-gap are near together it is very difficult to obtain a straight and white spark, the spark generally being slightly violet in colour and ramified in appearance. With a longer spark-gap, however, it is much easier to obtain a spark which is white in colour and non-ramified, and which passes with a sharp noise. It is a spark of this latter character which Hertz found to be best suited to his classical experiments, and the fact established by the author that such a spark really offers less resistance than a short violet spark, affords an explanation of Hertz's observation.

WITH the title "The People's Stonehenge," a slim little pamphlet, by Mr. J. J. Cole, has been published by Mr. J. Doney, Sutton, Surrey. The pamphlet contains ten reproductions from photographs of the objects at Stonehenge; and these, with the short descriptive text which accompanies them, brings out the points of interest in the most wonderful of our archæological remains.

ASTRONOMERS should be grateful to Messrs. W. Wesley and Son for the excellent catalogue of works on astronomy just published as No. 124 of the Natural History and Scientific Book Circular. The classification is very elaborate, the books being arranged under no less than twenty-four headings. In each section the books follow the alphabetical order of authors' names. Both the arrangement of the sections and the divisions adopted are admirable, and reflect great credit upon the compilers. Bibliophiles well know that a bookseller's catalogue is a mine of information, and they will be joined by astronomers in appreciation of the efforts of Messrs. Wesley and Son to produce a full and accurate list of works on celestial science.

THE *Proceedings* of the American Philosophical Society for January, 1895, reached us at the beginning of this week. Among other papers contained in it we notice a description (with four plates) of an old "Horologium Achaz," or Dial of Achaz, by Mr. J. F. Sachse; a paper on "The Significance of the Jugal Arch," by Mr. D. D. Slade; a note proving that thin leaves of gold, similar to those exhibited by Mr. J. W. Swan at the Royal Society in June 1894, were produced by Mr. A. E. Outerbridge seventeen years ago (on this matter, see Mr. Outerbridge's claim for priority in NATURE, vol. li. p. 608, 1895); a paper by Dr. D. G. Brinton on the "Protohistoric Ethnography of Western Asia," and the "Fourth Contribution to the Marine Fauna of the Miocene Period of the United States," by Prof. E. D. Cope.

MESSRS. MACMILLAN have just issued the first part of the "History of Mankind," by F. Ratzel, in which the learned author states what the task of ethnography is, and describes the situation, aspect, and numbers of the human race, together with a series of preliminary observations on the rise and spread of civilisation, religion, language, &c. Where possible he illustrates his remarks by pictures of genuine "savage" remains, and his theories have usually a good substratum of fact. It is, of course, too early to pass a final opinion on the work; but we believe that it supplies a want among the increasing number of people who need a popular history of the beginnings of the human race, and an intelligible account of the conditions under which our primitive ancestors lived. The part before us is printed in good type on excellent paper, and contains a coloured plate of a Bosjesman family, and a map of North and South America, besides several illustrations scattered throughout the text.

DR. A. B. MEYER has sent us a memoir (*Abh. u. Ber. des K. Zoolog. u. Anthropol. Ethn. Museums zu Dresden* 1894–95) on a

Brown Chimpanzee. The Chimpanzee described and figured in it is a young female living in the Zoological Gardens at Dresden, remarkable for its reddish brown hair, projecting eyes, and very bright-coloured skin. Dr. Meyer discusses at some length the numerous species, sub-species, and varieties of the Chimpanzee that have been proposed by various authors, and decides that his "Brown Chimpanzee" can be referred to none of them. It may be quite true that no one has previously described such a brown form of the Chimpanzeee, but nearly all mammals, especially the Quadrumana, are subject to lighter variations in colour, and we see no reason why this should not be the case with the Chimpanzee. It would seem, therefore, that Dr. Meyer has done well in not giving his Brown Chimpanzee a new scientific name. It appears that nothing is known of the history of the specimen, nor of its exact locality.

THE third and concluding portion of Kubary's monograph of the ethnography of the Caroline Archipelago is now published under the editorship of Herr J. D. E. Schmeltz, who has, as usual, spared no pains to bring out the memoir in a way which its value demands. The complete work consists of 306 pages and fifty-five plates; many of the latter are coloured. They are executed by Trap, which is a sufficient guarantee of their excellence. It is to the famous but ill-fated Museum Godeffroy that we owe the inception of this investigation. At a later date Kubary was connected with the Kgl. Museum für Völkerkunde in Berlin. The present section, which deals with house- and canoe-construction in the Pelan Islands, maintains the level of conscientious care and minute detail which characterised the two former parts. The structure of the houses and canoes is illustrated to scale by drawings in plan, elevation, and section; and details of fastenings and joinery are given on a larger scale. We have thus all the information necessary to understand structural details, which latter are too often lacking in the descriptions and illustrations of travellers. Some houses are richly decorated with carved and painted ornamentation; but unfortunately Kubary was not impressed with the importance of this branch of ethnography, and so we are left in ignorance as to the significance of the figures and patterns. What a pity it is that the ethnography of our Possessions and Protectorates in various parts of the world is not investigated and published in such a manner as this!

WE have received from Mr. J. Eliot, F.R.S., Meteorological Reporter to the Government of India, parts viii. and ix. of vol. v. of "Indian Meteorological Memoirs," containing the discussion of hourly observations made (1) at Deesa, a military station in the Palanpur State on the Banas River; and (2) at Kurrachee, the Port of Sind. The latter station is about three miles from the sea, and has a most complete exposure. The period embraced is 1875–93, and forms part of the proposed discussion of the observations recorded at twenty-five observatories. For each station the mean observed hourly values of the various elements, and the differences from the mean of the day, have been calculated, and from these the diurnal variations have been resolved into four component harmonic oscillations by the application of Bessel's formula, while the epochs and values of the diurnal maxima and minima have been computed by the method used by Dr. Jelinek, to the second approximation. The investigation of the materials at each station is of itself a most laborious and thorough piece of work, and the complete discussion will be probably unequalled in magnitude. The importance of the whole investigation can scarcely be over-estimated, and when the results are collated they cannot fail to throw much light upon the causes which underlie the periodic variations over this vast area, and their dependence on various physical and local conditions.

XYLOSE, like arabinose, gives two optically active stereoisomeric acids on treatment with hydrocyanic acid and subsequent hydrolysis. Of these, gulonic acid has long been recognised; the second, idonic acid, has recently been isolated, and its derivatives prepared by Émil Fischer and Irving Wetherbee Fay (*Berichte*, 1895, No. 14, p. 1975). The series is remarkable as containing the last missing members of the mannitol group of acids, sugars, and alcohols. The names—idonic acid, idose, iditol, and idosaccharic acid—assigned to these substances have been derived from "idem," and given on account of the symmetrical geometrical formulæ expressing their constitution. From the formula of l-idose,

$$\begin{array}{c} \mathrm{H\ OH\ H\ OH} \\ \cdot\ \ \cdot\ \ \cdot\ \ \cdot \\ \mathrm{CH_2OH\ .\ C\ .\ C\ .\ C\ .\ C\ .\ COH} \\ \cdot\ \ \cdot\ \ \cdot\ \ \cdot \\ \mathrm{OH\ H\ OH\ H,} \end{array}$$

it is evident that hydroxyl and hydrogen are similarly related to each of the asymmetrical carbon atoms, and that only the *same* product, racemic acid, and no inactive tartaric acid can be produced by oxidation wherever the molecular chain is broken; in this respect a remarkable contrast to the other hexoses being shown. From the product of the action of hydrocyanic acid on xylose, gulonic acid was separated by repeated crystallisation of the lactones; the syrupy dark liquid resulting on evaporation of the mother liquor was diluted and treated with brucine. The product on evaporation and addition of a large quantity of alcohol gave a crystalline mass of brucine idonate. When purified and recrystallised from methyl alcohol it formed colourless prisms, or long rectangular plates, which melted with decomposition between 185° and 190° (corr.). The acid was prepared from the brucine salt by addition of barium hydrate and subsequent decomposition of the barium salt with sulphuric acid. Ultimately a relatively good yield of idonic acid and its lactone was obtained as a colourless syrup, which dissolved easily in water, and with difficulty in alcohol, and was insoluble in ether. 0·5 gram dissolved in 3·5 grams of water gave a rotation of $-5{\cdot}2°$ in a decimeter-tube. The normal idonates of calcium, barium, cadmium, and lead are amorphous and very easily soluble in water. A characteristic cadmium double salt, $(C_6H_{11}O_7)_2Cd.CdBr_2.H_2O$, crystallises in fine, colourless needles. The corresponding sugar, l-idose, was prepared from the syrupy mixture of idonic acid and its lactone by reduction with 2½ per cent. amalgam after dilution with ten times its volume of ice-cold water. The sugar was isolated in the usual way as a syrup, which could not be completely purified through lack of material. A 10 per cent. sterilised solution did not ferment with yeast. The osazone, prepared as usual, could not be distinguished from gulosazone. The alcohol of this series, l-iditol, was obtained by the further reduction of idonic acid by sodium amalgam, first in acid, and finally in alkaline solution. It was purified by formation of the benzaldehyde compound, recrystallised from acetone in colourless needles of the composition $C_6H_8O_6(CH.C_6H_5)_3$. The purified compound, on treatment with sulphuric acid and alcohol, gave the alcohol as a colourless syrup very easily soluble in water. The idosaccharic acid was formed from idonic acid by treatment with nitric acid, and yielded crystalline calcium and copper salts.

THE additions to the Zoological Society's Gardens during the past week include a Brown Capuchin (*Cebus fatuellus*) from Guiana, presented by Sir Egbert Sebright, Bart.; a King Parrakeet (*Aprosmictus scapulatus*) from Australia, presented by Mr. George Cawson; two White Storks (*Ciconia alba*), European, presented by Sir Charles Payne, Bart.; an Ortalan Bunting (*Emberiza hortulana*), European, presented by Mr. H.

C. Martin; two Hybrid Widgeons (between *Mareca penelope* and *Anas boschas*), bred in England, presented by Mr. Wellesley Taylor; a Cape Viper (*Causus rhombeatus*), two Rufescent Snakes (*Leptodira rufescens*) from South Africa, presented by Mr. J. E. Matcham; a Great Kangaroo (*Macropus giganteus*) from Australia, deposited; two Hunter's Spiny Mice (*Acomys hunteri*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

RUTHERFURD'S STELLAR PHOTOGRAPHS. — The pioneer work of the late Dr. Rutherfurd in photographic star charting is gradually assuming a form which gives the results a high scientific value. In 1890, Dr. Rutherfurd presented his original negatives, many of them taken more than twenty years ago, to the Columbia College Observatory, New York, together with some thirty volumes of measures of certain star photographs, and Prof. J. K. Rees was authorised to arrange for the discussion of the photographs. After Dr. Rutherfurd's death in 1892, his son, Rutherfurd Stuyvesant, generously provided funds for continuing the reduction and publication of the measures. The results obtained for the stars of the Pleiades group, and for the stars about β Cygni have already been published, as well as an investigation of the parallaxes of μ and θ Cassiopeiæ. To these are now added two papers giving full details of an investigation of the parallax of η Cassiopeiæ, and of the reduction of positions of sixty-two stars in the neighbourhood (*Ann. New York Acad. Sci.*, vol. viii. 301, 381). Using three pairs of comparison stars, the parallax deduced for η Cassiopeiæ is $0''\cdot443 \pm 0''\cdot043$; or, taking six pairs, $0''\cdot465 \pm 0''\cdot044$ (see NATURE, vol. lii. p. 61). In view of the difficulty of getting comparison stars suitably situated either with respect to position angle, or distance, it was considered desirable to take a larger number than usual, and hence six pairs were reduced, being all that were sufficiently impressed on the plates in both seasons of the year. Only the three pairs which lead to the first-named value, however, are so situated with reference to the parallactic ellipse as to give good coefficients for the parallax.

RADIAL VELOCITIES OF SATURN.—The recent spectroscopic investigations of the velocities in the Saturnian system furnish an admirable illustration of the accuracy at present attainable in this department of astronomical research. Prof. Keeler, M. Deslandres, Prof. Campbell, and Dr. Belopolsky have each in turn directed their attention to the planet, and the following table brings together the different results obtained, and compares them with the computed velocities:—

	Equatorial velocity of planet.		Excess of velocity for inner edge of ring.	
Keeler	... 10·3 km.	per sec.	... 3·6 km.	per sec.
Deslandres	... 9·4	,,	... 4·7	,,
Campbell	... 9·77	,,	... 3·13	,,
Belopolsky	... 9·4	,,	... 5·5	,,
Computed	... 10·3	,,	... 3·9	,,

It thus appears that in the hands of competent observers, the photographic methods now employed for the determination of velocities along the line of sight may be relied upon to give values which are correct to within one kilometre per second; while for results depending upon the measurement of more than one velocity, a little greater latitude must be allowed.

In reply to the objection of M. Deslandres and Prof. Seeliger, that the spectroscopic results do not strictly prove the meteoritic constitution of the ring, Prof. Keeler has pointed out that any other explanation which is consistent with them can only be regarded as artificial, or inherently improbable (*Ast. Nach.* 3313). If the ring were composed of concentric solid rings, a line in the spectrum would be made up of short straight lines, like an end view of a flight of stairs. Prof. Keeler does not consider his own photographs capable of showing more than ten such subdivisions, for if the number were greater than this, the step-like structure of the lines would be destroyed by unavoidable errors in guiding; but up to a certain point the effect would still be apparent in the widening of the lines. He finds, however, that the definition of the lines in the spectrum of the ring is less affected by guiding errors than that of the lines of the planet, as might be expected if the lines were smooth curves such as would be produced in the case of a meteoritic ring.

THE CAPE OBSERVATORY.—Dr. Gill's report of the work done at the Cape Observatory during 1894 has been distributed. It opens by pointing out that the chief desideratum in astronomy during the past decade has been an adequate provision for the study of astrophysics in the southern hemisphere. As the readers of NATURE are aware, Mr. Frank McClean, F.R.S., has given to the Cape Observatory a splendid equipment for such work, so the need has been met, and a harvest of results may be looked for as soon as the instrument is erected. With reference to this generous gift, the report says that the telescope will have a photographic object-glass of 24 inches aperture and 22½ feet focal length, and be provided with an objective prism of the same aperture having a refracting angle of 7½°. Mounted parallel to this there will be a visual telescope of 18 inches aperture and of the same focal length as the photographic telescope. The equatorial mounting will have complete circumpolar motion for within 30° of the zenith; and will be sufficiently elevated to allow of a slit spectroscope suitable for determining motion in the line of sight. Such a spectroscope will also be provided by Mr. McClean, together with an observatory of light construction. The instrument has been for some time under construction by Sir Howard Grubb, and will probably be completed before the end of 1896.

Among the work done with the astro-photographic telescope, we notice that, after rejecting all plates of insufficient exposure, or which are otherwise faulty, only 70 of the plates for the Catalogue, out of 1632 areas assigned to the Cape, remain to be done. Of the chart plates, 263 have been passed as satisfactory.

Measures of the diameters of the photographic discs of a variable star in Vela, together with those of nine comparison stars, prove the former to be a variable of the Algol type, its period being about 5d. 22h. 24m. 4s. A complete discussion of the light curve and period will shortly be undertaken.

The researches on the solar parallax have been carried forward, three sections of the work, on the observations of the minor planets Victoria and Sappho, having been passed through the press. The manuscript of the definitive discussion of the observations of Victoria has been sent to the printers; while the computations of the solar parallax from the observations of Sappho and Dr. Elkin's reductions of the observations of Iris are completed.

THE INSTITUTION OF MECHANICAL ENGINEERS.

AN ordinary general meeting of the Institution of Mechanical Engineers was held on the evenings of Wednesday and Thursday, October 23 and 24, at the Royal United Service Institution, Whitehall, the Council having lent their new theatre for the purpose. The building of the Institution of Civil Engineers, where the Mechanical Engineers have held their London meetings for years, is now in process of rebuilding. It is to be hoped, however, that the Institution of Mechanical Engineers will, before long, have their own premises.

There were three papers down for reading on the first day of the meeting:—

"The Electric Lighting of Edinburgh," by Henry J. Burstall.

"Report on the Lille Experiments upon the Efficiency of Ropes and Belts for the Transmission of Power," translated by Prof. David S. Capper.

"Observations on the Lille Experiments upon the Efficiency of Ropes and Belts for the Transmission of Power," by Prof. David S. Capper.

The chair was taken on each evening at 7.30, by Prof. Alexander B. W. Kennedy, F.R.S. On the first evening Mr. Burstall's paper was read and discussed.

The electric lighting of Edinburgh is in the hands of the Corporation. It was decided upon in 1893, when the work of designing and superintending the scheme was entrusted to Prof. Kennedy, the President of the Institution. From an electrical point of view the city consists of two districts. In one the houses are close together, and the demand for light may be expected to be fairly concentrated; in the other it will be more scattered. Having regard to the different districts to be served, and taking into account all the local circumstances, it was decided, after comparison of the various systems of supply and distribution which could be used, to adopt a low tension three-wire system

for the central and northern district, and an alternating-current high tension system for the southern and eastern district, both systems being worked from one central station, and under the same control and management. A good site was found for the central station between the Caledonian Railway and Dewar Place.

The boiler-house is designed to contain seventeen boilers, of which at present only six are in place. They are of the dry-backed marine type, each 10½-feet mean diameter and 12 feet long, with two Purves flues 3¼ feet inside diameter, and 166 tubes of 3 inches internal diameter. The boilers are of steel with wrought-iron tubes. On the top of the boilers are fitted super-heaters, each having two nests of tubes enclosed between the top of the boiler shell and a fire-brick casing above. Each consists of thirty-two vertical flat coils of wrought-iron tube 1½ inches diameter. Sinclair's mechanical stokers are fitted to each boiler, and are driven by an electric motor. The main steam pipe forms a complete ring round the present boilers. This ring joins the engine-room main at two points, and is provided with valves, so that the failure of any one pipe will put only the corresponding boiler out of use. The pump-room contains at present one duplex steam pump and two three-throw pumps driven electrically, each pump specially designed to run with a large range of speed, and for this purpose can be connected with either the 230-volt or the 115-volt mains. A Kennedy water meter is connected with one range of feed pipes, so that the whole of the water going to the boilers can be measured. In the pump-room is placed the electric motor for driving the mechanical stokers with its counter shaft. The coal brought in the railway trucks is at present stored in the east end of the boiler-house; on the station being extended, the coal will be stored over the boiler-house, and let down through shoots to the mechanical stokers. In designing the plant at present in the boiler-house, provision for extensions has been kept in mind, and the arrangements are such that new plant can be added at any time.

The engine-rooms are side by side, forming really one room divided by a line of columns which carry the roofs and the beams for the travelling cranes. The engine-room next the boiler-house is reserved for the low-tension plant, the other contains the high-tension plant. A platform, raised 4 feet above the engine-room floor level, runs the whole way across the west end of both engine-rooms; and on this are placed the switchboards and regulating gear for both the low- and high-tension systems. The machinery at present in the low-tension engine-room consists of eight engines, four of 100 I.H.P., two of 250 I.H.P., and two of 360 I.H.P., with their dynamos; and provision is made for eight more engines of 360 I.H.P., in the future. All are Willans central-valve engines driving their dynamos direct. All the dynamos are two-pole shunt-wound machines with drum armatures, all wound to give 270 volts, except two which are driven by two 100 I.H.P. engines; these two are wound to give 135 volts, being used as balancing machines on the three-wire system. The steam-piping forms, with part of the boiler-house ring, a complete ring round the low-tension engine-room, and is connected with the boiler-house ring at two points. The main ring is 8 inches internal diameter throughout. The straight lengths are of steel, with thick flanges screwed and brazed on; the tee pieces and valve boxes are of cast-iron; and the bends of copper with steel flanges. All bends are of large radius, and no expansion joints are used or required. The engines are erected in pairs, and are connected with the main ring by two long copper bends. The pipes are slung by long rods from brackets fixed on the walls or columns, so as to allow free movement. The main exhaust pipes are of cast-iron, and are led through a Berryman feed-heater, in the boiler-house to the chimney. Provision is made for three more heaters when required. The whole of the machinery stands on a concrete foundation block 7½ feet thick, which is separate from the foundations of the walls.

The main leads from the dynamos are drawn through curved wrought-iron pipes let into the concrete, into chases in the centre of the engine foundation block, along which they are carried to the chamber under the switchboard platform. The leads from the field winding off the machines are also carried in the same manner to their regulating resistances; the switches for these resistances are fixed upon the handrail on the platform in front of the switchboard, the leads from the resistances being brought up through the posts of the handrail. The switchboard, and the whole of the apparatus for regulating the dynamos and the batteries, and for the distribution of the current, are placed on the platform, and are directly under the eye of the engineer in charge. The switchboard consists of seven slate panels, each about 7 feet high, and stands 4 feet from the west wall of the engine-room. The arrangement of the switchboard and conductors was next described.

The battery-room has a fire-proof floor covered with acid resisting asphalt. The battery consists of 132 cells of the new Crompton-Howell 31-plate type. It is divided up into two half-batteries, positive and negative, and is arranged in two tiers on four rows of stands, which are of cast-iron, with wooden longitudinal bearers carrying the cells; the eight hospital cells are arranged on separate stands. All the cells are similar, and have each a nominal capacity of 1000 ampere hours, the normal rate of discharge being 200 amperes. The battery has ample capacity to meet the whole of the load of the station from daylight till the evening; thus during the summer time it can do the lighting during more than half the twenty-four hours. The high-tension portion of the station consists at present of only two engines and alternators with their switchboard, and the rectifiers for arc-lighting with their regulating arrangements and switchboard; but in the immediate future, this plant will be considerably extended. Each of the alternators is driven direct by a Willan's three-crank engine of 150 I.H.P., on the same bed-plate. The alternators are of the "Portsmouth" type, with some modifications necessary owing to their increased speed of 450 revolutions per minute. Their armatures are stationary, and are of great strength; the core, consisting of sheet-iron segments, is solidly bolted into the framing of the machine, with the coils threaded through holes in the sheet-iron, well insulated, and completely enclosed in brass boxes. The field magnets revolve, and consist of two heavy cast-steel discs, having on their circumference claws projecting sideways alternately over the field winding, which is between the discs, and is well protected from injury. The exciting current is taken from the low-tension switchboard at 230 volts, and is only a few amperes. The alternators work at an electromotive force of between 2000 and 2200 volts with a frequency of 52½ figures complete alternations per second. Opposite to the alternators, and standing on the same foundation block, are placed the Ferranti rectifiers for the series arc-lighting. These are three in number, one for each of the two circuits, and one to spare.

In the three-wire system of distribution for the northern and central districts, the electromotive force between the two outer conductors, positive and negative, is 230 volts, while that between the middle wire and the positive or negative is 115 volts. The latter is the electromotive force of the lamps on the consumers' premises, no trouble being now experienced in obtaining glow-lamps to work at this electromotive force, or even higher. The feeders from the station are connected to the distributing mains at sixteen points. They consist of two conductors only, the positive and negative; the middle wire is inter-connected throughout as much as possible, and is brought back from three districts on the system. The cables are put in parallel at the station, and one connection only is made to the switchboard. The positive and negative sides respectively of all the feeders are put in parallel at the switchboard; but any feeder or feeders can be put on a separate machine if required. As far as possible, consumers in each street and district are balanced against one another by connecting them alternately between positive and middle wires, and between negative and middle wires; large consumers have all three wires taken into their premises, and their lights balanced against one another in a similar manner. But however carefully this balancing is done, it is impossible to get a really accurate balance; the "out of balance" current varies from hour to hour, and even from minute to minute, and is different on different days of the week. The amount out of balance is compensated for at the station by means of the balancing machines, one of which can be put on either side of the system; the balancing during the light load is done from the battery alone. Light wires, forming potential leads or pilot wires, are brought back from all three conductors at each feeding point, and are connected to the feeder volt meters on the switchboard; so that the pressure at the feeding points at any part of the system is directly known at the station, and the necessary regulation made for keeping the electromotive force constant. The distributing mains are brought back to the station, but are used only for the supply of light and power there; no regulation is done on the mains anywhere, except to the feeding points. No high-tension feeders or distributing mains have yet been laid, but will be added later.

In regard to road-work, practically the whole of the distributing mains are laid as cable insulated with india-rubber

heavily braided, drawn into Doulton stoneware casing under the footways, and into either Crompton-Davis cast-iron casing or cast-iron pipes under the roadways. At all crossings, and at intermediate places on the foot-ways, brick junction boxes are built. Wherever sufficient space has been found under the foot-ways, the feeders have been laid as bare copper strip, carried on stoneware insulators in concrete culverts. Across all roads, and where there has not been sufficient space for culvert, the feeders are laid in Siemens armoured cable, laid direct in the ground. All the feeders have been designed to have a total drop of 44 volts at full load Potential leads, by which each feeding point is connected back to the station, consist each of three sets of wires, insulated with specially prepared paper, laid up together and covered with the same material, a lead tube being drawn over the whole. All of the cable connections are made by cone connectors, sweated on to the cables, and fitting into gun-metal connecting blocks.

The author concluded by stating that he had endeavoured to describe the arrangement of the plant and mains, and any details in their design and construction which might be of interest, without discussing general principles or the advantages or disadvantages of any individual system.

In the discussion which followed the reading of the paper, the chief point raised was the advisability of using a dual system of supply; but the author very well disposed of the objections raised in this direction by pointing out that the area to be dealt with consisted of two districts differing widely in character. For one the high pressure alternating system was most desirable, and for the other a low tension system. It is easy, as Mr. Burstall said, to maintain that either system is wrong if the disadvantages of that system are given undue prominence, and the advantages of the rival system are brought prominently forward. Of course, the benefit of the high-tension alternating system consisted in the saving of copper, but that was a thing that perhaps would not work out in practice exactly in the same way as it was presented in theory. On paper, a larger main was required for low-tension transmission, but practically there was often no saving in copper. As a matter of fact there is, however, an economy in material in the feeders. It becomes a question of balance of advantages, whether certain points shall be sacrificed to the saving of copper. Mr. Burstall stated that so far as Edinburgh was concerned, no less than six schemes were worked out in detail before it was decided to adopt the plans described in the paper. The discussion also ranged over the question of superheating steam, the efficiency of feed pumps, and various other engineering details, which, however, it is not necessary here to consider in connection with an electrical paper, especially as no new facts of importance were added to one's information upon these matters.

The second paper, on the Lille experiments with ropes and belts, does not need any extended notice at our hands. The Société Industrielle du Nord de la France had the question of transmission of power brought before them by a paper by M. V. Dubreuil, and it being considered advisable to obtain more information on this subject, a commission was appointed, and the Institution of Mechanical Engineers was invited to send a representative. Various trials were made with ropes and belts under different conditions. Owing to the want chiefly of dynamometer records, no very exact figures could be deduced from the experiments, so far as the actual power transmitted was concerned. An effort was made to make the experiments comparative as between ropes and belts, by keeping the experimental conditions in both cases constant. It is somewhat doubtful, however, to what extent these efforts were attended by success. Generally speaking, it may be said that the results arrived at showed the power absorbed by transmission to be equal, whether ropes or belts were used. This conclusion, however, must be accepted with some reserve.

Prof. Capper in his paper, commenting on the experiments, attempted to arrive at some conclusion as to the efficiency of the whole system. His figures were excellently worked out, but he himself acknowledged that the data upon which he based his calculations might be open to question Although, therefore, the experiments may not be of great use to future designers of machinery, the thanks of English engineers are none the less due to the Société Industrielle for their courtesy in inviting the Institution of Mechanical Engineers to send a representative to watch the proceedings. The Institution is also to be congratulated in being able to send so competent an observer as Prof. Capper as their representative.

A long discussion followed the reading of the paper, which occupied the rest of the evening. Perhaps the most interesting part of it were the remarks of Mr. Crompton, who stated that the question of transmission by ropes and belts did not possess any longer the importance it once did, as within a few years the silent, flexible connecting rod, called electricity, would supersede all other methods of transmission, so that ropes and belts would only be found exhibited in museums, as mechanical curiosities of a past era.

RECENT FISHERY LITERATURE.

THE general report for 1894 of the Fishery Board for Scotland contains evidences of the revolution which is quietly but steadily effecting a complete change in the methods of the fishing industry. There is a further falling-off in the number of fishermen and fishing boats engaged in the herring and line fishing. The sailing craft continue to give way before steam trawlers and steam liners, and the competition for the best markets is bringing about an increased centralisation of the fishing industry. The smaller and healthier creeks and villages are being gradually depopulated, and the larger ports are becoming overcrowded. The summer herring fishing is being forsaken for line fishing, which can be prosecuted all the year round. Steam liners are consequently increasing rapidly in number, and during the past year have proved most successful. Indeed, in spite of the falling off in the means of capture, the decrease in the total quantity of fish landed, as compared with the returns for 1893, amounted to only 19,000 cwts. This state of things may be attributed to the fact that the steam trawlers and liners are able to proceed much further out to sea than sailing craft, and are able to fish over fresh grounds where large catches are frequently obtained. Being larger and stronger, moreover, these vessels are to a great extent independent of wind and weather, which seriously affect the movements of the smaller sailing boats. Herring were locally plentiful, and of a quality never excelled within modern times. They were especially abundant in the Orkneys and Shetlands—where the catch was double that of 1893—and in the Campbelltown area; but the herring fishery in the Hebrides was again a failure, and this is the more to be regretted as Stornoway, the most important centre for ling, also exhibited a large falling off in the returns of the latter fish. It is gratifying to notice a slight increase in the returns of flat fish, especially in view of the complaints of the depletion of grounds frequented by them. The increase may, however, be due to the hauls made by steam trawlers working on fresh and more distant grounds. For the first time in the Board's returns, a table is given of the number of persons engaged in Scotch fisheries on sea and land; there are more than 117,000 people taking some part in the various branches of the industry.

The report of the same Board on Salmon Fisheries shows that the season of 1894 was in most districts below the average. On the other hand, salmon disease appears on the whole to have been less prevalent during 1894 than in the previous year.

In an interesting and amusing article on the North Sea fisheries ("Journal of the Marine Biological Association," vol. iii., 1895), Mr. Holt devotes especial attention to the question of the destruction of immature fish. The fact that there has been a diminution of the fish supply during recent years seems to be thoroughly established, although the improved boats and methods of fishing render this decrease less striking than might otherwise be the case. The alleged cause of this diminution is over-fishing, that is to say over-trawling, but inshore trawlers, shrimpers, and other fishermen do not appear to be blameless in the matter. During some years' residence at Grimsby, Mr. Holt has collected statistics on this question. They are necessarily incomplete, as time and opportunity did not permit of wide investigation; they are, however, fairly complete in the case of the plaice, one of the most important of our flat fishes, and Mr. Holt's evidence concerning this fish is very striking. He states that during a whole year's trawling on the North Sea grounds 57 per cent. of the plaice brought to shore were sexually immature, and had thus never had a chance of reproducing their species, and so contributing to the maintenance of the supply. In the Conference of 1892 the size limit for plaice was made 10 inches; they are marketable at this size, although not sexually mature, for Mr. Holt finds that as a rule North Sea plaice are not mature until they attain a length of 17

inches. Fish vary in size under different conditions and in different areas, and on the south-west coast the limit of size for maturity in plaice is 13 inches according to Mr. Cunningham. An immense number of the small plaice brought to market are caught on the eastern grounds; and this area forms also a nursery and spawning haven for turbot, brill and soles. The number of plaice above 10 inches on these grounds is inconsiderable; and if a size limit of 13 inches for plaice brought to market were enforced, even during the spring and summer only, such a limit would suffice to keep trawlers off these grounds, which would thus be left unmolested. In conclusion, Mr. Holt considers various remedial measures for checking the depletion of the North Sea grounds, and of enabling the fish supply to recover; but the only practicable method of attaining this end at present is by legislation based on the principle of the size limit.

THE FORMATION OF BACTERIAL COLONIES.[1]

THE author has examined the details of development of the colony from a single spore, in numerous species, by employing microscopic plate-cultures, which can be kept under observation under a one-twelfth and even a one-twentieth oil immersion, or by making pure *Klatschpräparate* of the growing colony on cover-slips covered with a thin film of gelatine.

He finds many factors of importance in affecting the form, extent, rapidity of growth, and other characters of colonies. The elasticity of the gelatine, the presence of moist films on the surface of the gelatine, the rate of (slight) liquefaction, &c., all being of importance, in explaining the shapes, &c., of submerged colonies—"whetstone shaped," moruloid, spherical, or lobed colonies—the mode of emergence and spreading over the surface of the gelatine, the formation of radiating fringes, iridescent plates, &c.

Exposure to light during the development of liquefying colonies may profoundly affect their shape and other properties, a phenomenon closely connected with the retardation of liquefaction and growth. Pigment bacteria may give rise to perfectly colourless races when cultivated under certain conditions, and the colour restored by again changing the conditions, a fact which the author has not only confirmed with red forms, but which he shows to be true of a violet bacillus. Species commonly described as non-motile show active movements under certain conditions, and the sizes of bacteria are not constant in different regions of one and the same colony. Details have been worked out for series of types, the extremes of which differ considerably in liquefying power, and essential difference in the appearance of a colony may depend on the amount of liquefying power evinced.

Some curious cases of travelling films, the lobes and contorted tresses of which move like amœbæ over the surface of the gelatine, were also examined.

The facts point to (1) differences in colonies even of one species may depend on much more subtle differences in cultures than are usually recognised; (2) varietal differences may occur in two bacilli of the same species (isolated from the river), due to the different vicissitudes the two individuals have been subjected to during their sojourn in the water; (3) the difficulties met with in diagnosing "species" of bacteria with the aid of works of known authority, are partly due to varieties of the same species being recorded by different observers under different names, and the author thinks some more consistent pre-arranged plan of working out the characters of such forms should be developed by bacteriologists than at present exists.

A False Bacterium.

The author has isolated from the Thames a form which gives all the ordinary reactions of a bacterium in plate-cultures and tube-cultures in gelatine, agar, potato, broth, milk, &c.

It is a rod-like form, 1 μ thick, and up to 2 or 4 μ long, stains like a bacillus, and cannot be distinguished from a true Schizomycete by the methods in common use.

On cultivating it under high powers—one-twelfth and one-twentieth oil immersions—from the single cell, however, it is found to form small, shortly-branched mycelia, the growth and segmentation of which are acropetal. This turns out to be a minute oidial form of a true fungus.

Its true nature can only be ascertained by the isolation and culture through all stages from the single cell, according to the original methods of gelatine cultures of Klebs, Brefeld, and De Bary, which preceded and suggested the methods employed by bacteriologists; and the facts discovered raise interesting questions as to the character of alleged "branching" bacteria on the one hand, and the multiple derivation of the heterogeneous group of micro-organisms, termed bacteria in general, on the other.

[1] Abstracts of two papers, read before Section K of the British Association at Ipswich by Prof. H. Marshall Ward, F.R.S.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The following have been appointed Examiners in Natural Science for the current academical year:—Physics: Dr. O. J. Lodge, F.R.S., and Mr. L. R. Wilberforce. Elementary Physics: Mr. H. F. Newall and Mr. S. Skinner. Chemistry: R. Meldola, F.R.S., and Mr. W. J. Sell. Elementary Chemistry: Mr. F. H. Neville and Dr. S. Ruhemann. Mineralogy: Prof. N. Story-Maskelyne, F.R.S., and Mr. H. A. Miers. Geology: Prof. G. A. J. Cole and Mr. H. Woods. Botany: Dr. H. M. Ward, F.R.S., and Mr. H. Wager. Zoology: Prof. S. J. Hickson, F.R.S., and Mr. S. F. Harmer. Elementary Biology: Mr. A. C. Seward and Mr. J. J. Lister. Anatomy: Prof. A. Macalister, F.R.S., and Prof. A. M. Paterson. Physiology: Mr. W. B. Hardy and Prof. W. D. Halliburton, F.R.S. Pharmaceutical Chemistry: Mr. A. Ivatt and Mr. R. H. Adie.

Dr. Glaisher, F.R.S., and Mr. R. T. Glazebrook, F.R.S., of Trinity College, and Prof. G. B. Mathews and Mr. A. E. H. Love, F.R.S., of St. John's College, have been appointed Examiners for Part II. of the Mathematical Tripos; and Prof. Ewing, F.R.S., Prof. Reynolds, F.R.S., and Mr. J. B. Peace, of Emmanuel College, have been appointed Examiners for the Mechanical Sciences Tripos.

The twenty-second annual report on the local lectures has just been issued. It touches upon a number of interesting questions. Of the work temporarily undertaken for County Councils three years ago, the only portion that remains vigorous is that carried on in connection with the Norfolk County Council in the preparation of teachers in elementary schools to teach science subjects in evening classes. These courses, given in the county of Norfolk, have been supplemented by practical laboratory work in Cambridge during the Long Vacation, which has been attended by teachers holding scholarships from the Norfolk Council. The Syndicate state in the report that they are persuaded that this is a work of great value, and that they believe that it is in this direction, rather than by the provision of ordinary technical courses for rural audiences, that they can now best aid the technical education work of County Councils. During the past session the scheme of certificates has been remodelled so as to encourage more continuous and systematic work, and has already begun to show good results. The most important part of the report is that in which the Syndicate announce their intention to appeal for funds to enable the University to develop and extend the work in a more systematic way by placing particular districts in charge of superintendent lecturers, who will form a direct link between the district and the University. Appended to the report is a special report by Dr R. D. Roberts, the secretary for lectures, in which a large scheme for the future development of the work is sketched and practical proposals suggested.

A DIRECTORY of Science, Art, and Technical Colleges, Schools, and Teachers in the United Kingdom, by Mrs. R. S. Lineham, has been published by Messrs Chapman and Hall. The directory will undoubtedly prove of great value to all who are concerned with scientific and technical education. It contains a list of schools arranged alphabetically according to towns, with the names of secretaries, principals, and teachers, and the number of students taught in each subject. There is also an alphabetical list of names and addresses of teachers of science, art, and technology, arranged under the headings of subjects taught. Other information of particular use to teachers under the Science and Art Department, and needed now and then by all promoters of elementary scientific education, will be found in the volume. Complete the directory is

not, nor is it infallible; but it is a praiseworthy attempt to organise into one guild the teachers of a growing and most important section of educational work. The labour involved in getting together the facts which make up the contents must have been immense, and it is to be hoped that, now the work has been done, the support required to ensure the annual publication of the directory will not be lacking. If the book only makes teachers in technical schools and institutes realise that they are part of one organic whole, having for its object the extension of scientific knowledge, it will accomplish a much-desired end.

THE Report of the Technical Educational Committee of the Berks County Council is optimistic, but it is not distinguished by descriptions of any very noteworthy developments. Berkshire is an agricultural county, and that is tantamount to saying that little encouragement is given to scientific education. Such counties are not willing to be taught much about principles; what they will tolerate, are subjects like practical butter-making, laundry-work, poultry-keeping, hedging, and horse-shoeing; but to attempt to teach agriculturists anything much beyond manual dexterity, is to court opposition. However, the Technical Education Committees are doing something to educate the agricultural mind to a better appreciation of the benefits to be derived from science, though it must be confessed that the rate of progress is extremely slow. Berkshire, along with Oxfordshire and Hampshire, contribute towards the maintenance of the University Extension College at Reading, and, in recognition of the satisfactory development of the agricultural department of the college, the Board of Agriculture recently granted a sum of £500, and the money could not have been better bestowed. The various courses of study at the college are well arranged, and valuable field experiments are carried on. By paying over the sum of £400 to the college, the Berkshire Committee ensures efficient instruction for the students under their care, and that is a very important consideration, for the supply of good teachers, competent to teach science as it should be taught, is comparatively small, to say nothing of the laboratory accommodation essential for truly scientific instruction. In spite of the facilities thus offered, the lectures in elementary science arranged for teachers were not successful. It would be a great pity if the Committee had to discontinue this part of their work on account of the want of support by the teacher for whom the lectures are intended. The other ways in which the Committee disposes of the funds allocated to technical education are evening continuation classes, scholarships, dairying, farriery, and bee-keeping. Aid is also given to classes in the principles of agriculture, mensuration, botany, drawing, horticulture, chemistry, mechanics as applied to agriculture, and to manual instruction in woodwork and metalwork.

THE Brussels correspondent of the *Times* reports that the electrical and anatomical institutes founded by M. Ernest Solvay, and presented by him and other donors to the University of Brussels, were officially inaugurated on Monday, under the presidency of the Burgomaster, assisted by M. Graux, the Chancellor, and the entire body of professors. Delegations from the English and Continental Universities have responded to the invitation of the Brussels University to take part in the series of *fêtes* organised in celebration of the event.

IT was announced a few weeks ago that the Treasury has thoughts of reinstating King's College, London, in the enjoyment of its share of the grants made to University Colleges. In consequence of this decision, the Council of the College have adopted a conscience clause as a standing regulation.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, October 25.—Mr. Walter Baily, Vice-President, in the chair.—Prof. J. Perry read a paper, by himself and Mr. H. F. Hunt, on the development of arbitrary functions. During the discussion on Prof. Henrici's paper (April 13, 1894), one of the authors described a graphical method of developing any arbitrary function in a series of other normal forms than sines and cosines, such as Bessel's or zonal spherical harmonics. The method consisted in wrapping the curve which represents the function round a specially shaped cylinder, not circular, and projecting this curve on to a certain plane. Many months were wasted in finding with great exactness a sufficient number of coordinates of the trace of the cylinder suitable for a Zeroth Bessel development. The labour, however, was unnecessary, since the coordinate most troublesome to calculate is not really needed, the projection only taking place in one direction. To develop any arbitrary function of x (say y) in normal forms, the real difficulty consists in finding the value of an integral such as $\int_0^a y.\ Q(x).\ dx$ where $Q(x)$ is some tabulated function. If now z is another tabulated function which is the integral of $Q(x)$, the required integral is $\int y dz$. If the values for y for 25 equidistant values of x are known, from $x = 0$ to $x = a$. Let the corresponding values of z be tabulated, and let a curve be drawn with the values of y as ordinates and the values of z as abscissæ; the area between the axis of z and this curve gives the value of the integral required. The authors give four tables containing the abscissæ for the four first terms in the development in Zeroth Bessels. They have tested the method by applying it to the calculation of a known function in terms of zonal spherical harmonics, and the agreement between the true value of the coefficients and those found is very satisfactory. Prof. Henrici said the method was a new departure, since in the place of an instrument of complicated design the authors only used a planimeter and pencil and paper, and obtained the same degree of accuracy. The fact that the series employed to test the method consisted of a finite number of terms seemed to him an objection. Prof. Karl Pearson had in a recent conversation informed him of a method for the development of functions which he (Prof. Pearson) had recently discovered. This method was not, however, so simple—at least in most cases—as that of the authors. Prof. Minchin thought it would add to the intelligibility of the paper if it were stated that the method was similar to that employed when expanding in terms of a Fourier series or in spherical harmonics. In these cases you have a function which, when multiplied by other functions of different orders, kills all the terms except one. Graphic methods ought, in his opinion, to be very much oftener employed, and he considered that there was no problem in physical mathematics of which the solution could not be obtained by graphic methods. He would also like to know if Prof. Perry had obtained a graphic method of calculating Bessels. Mr. Trotter agreed with Prof. Minchin as to the neglect of graphic methods. He regretted that Prof. Perry did not continue to consider the method as the projection from a cylinder, as he had found the method of wrapping curves round a cylinder most useful. Prof. Perry in his reply said he had adopted the expansion they had employed, under the impression that the test was a particularly severe one. He had not discovered a graphic method of calculating Bessels. The reason they gave up the cylinder was the immense labour involved in calculating the y coordinates of the trace, which would afterwards be of no use in the development of the function.—Mr. F. W. Lanchester read a paper on the radial cursor, a new addition to the slide-rule. The ordinary form of slide-rule enables calculations to be made which involve multiplication and division, also involution and evolution where the indices are integers. The radial cursor allows of the solution of problems in which fractional indices occur; for example, in questions involving the adiabatic expansion of a gas, where an expression of the form $pv_\gamma = \text{const.}$ has to be dealt with, and where γ is not an integer, nor is it constant for all gases. In this case it is necessary to provide some ready means of dividing the scales on the rule and slider proportionally to the value of γ, which corresponds to the division and multiplication of the respective logarithms of the quantities dealt with in the proportion of the indices of p and v, *i.e.* 1 and γ. This proportionate division of the scales is effected in the new cursor by a radial index-arm which is arranged to swing about a stud fixed to a sliding-bar running in guides at right angles to the rule. All readings are taken at the points of intersection of a line on the radius arm and the edges of the slide. The distance of the pivot, on which the radius arm turns, from the scale, and therefore the value of the index employed, is read off on a scale fixed to the transverse bar. Mr. C. V. Boys said that owing to the kindness of the author he had been able to try the cursor, and had found it of great service in dealing with questions of adiabatic expansion. The new addition to the slide-rule suffers under the same disadvantage as the rule itself, namely that a verbal or written description seems so very much more complex than is the actual operation when using the rule. The author's device might be described as an india-rubber slide-rule, for it performed the function of a slide-rule in which the graduations

of the slide were made on india-rubber so that the ratio of the length of the scale on the rule to the length of the scale on the slide might be altered at will, and thus involution and evolution with fractional indices performed. Mr. Blakesley asked how powers less than unity were dealt with. Prof. S. P. Thompson and Mr. Trotter expressed their admiration for the author's method of "stretching" the scale. Mr. Burstall said he had attempted to apply a similar method to the Fuller rule, but did not succeed, since in this scale there was only one scale. He hoped the author's method could be applied in a form such that a greater accuracy than one in 300 could be obtained. Mr. Bourne thought the fact that the point of intersection of two lines inclined at an acute angle had to be read was likely to limit the accuracy. The author having replied, the Society adjourned till November 8.

PARIS.

Academy of Sciences, October 21.—M. Marey in the chair.—The decease of M. Hellriegel (Correspondent of the Rural Economy Section), at Bernburg, Anhalt, on September 24, was announced to the Academy.—A study of graphite extracted from a pegmatite, by M. Henri Moissan. The author concludes, from the impressions of markings on the graphite crystals transferred to surrounding quartz and felspar, that the graphite existed before the pegmatite was formed. This graphite much resembles graphite formed in the electric furnace in fused metals, and may have been formed under somewhat similar conditions.—A study of some varieties of graphite, by M. Henri Moissan. Graphites found in nature may be divided, as recommended by M. Luzzi, into intumescent and non-intumescent graphites. The former appear to have been produced in fused metallic masses, the latter by the action of a raised temperature on any variety of amorphous carbon.—On the Mounier Observatory, by M. Perrotin. Details are given concerning observations on the surface of Venus. The lack of alteration in the characteristics of the part of the surface viewed during a considerable time supports Schiaparelli's contention that the planet can only rotate with great slowness.—M. Mascart presented an "Atlas of the 'isanomals' and secular variations of terrestrial magnetism," by M. Al. de Tillo. The general conclusions able to be drawn from a study of the lines of secular variation are: (1) the changes of the elements so occur that in one hemisphere they are positive, and in the other negative; (2) there is a great similarity between the trace of the isanomals and that of the lines of equal secular variation.—Prof. Norman Lockyer presented some photographs of star spectra taken with an objective and prism made by the Brothers Henry. The lines in the spectrum of Bellatrix correspond to those of helium. The absorption due to the atmospheres of stars showing few lines is due mostly to hydrogen and helium.—The following articles, by M. Cruls, are printed in the Correspondence: (1) Posições geographicas. The geographical positions determined are those of Rodeio, Entre-Rios, Juiz de Fora, Joad Gomes, and Barbacena along the Central Railway. (2) Les éléments climatologiques de Rio. Given by a discussion of data from 1851 to 1890 (3) Éclipses de Soleil et occultations.—On a long period inequality in the longitude of Mars, by M. G. Leveau. An empirical correction proposed by Newcomb to the Le Verrier tables of geocentric longitude, and supposed to be due to a want of sufficient precision in the determination of the theoretical value of a coefficient, is shown by the author's calculations by an independent method not to be required by any error in the tables, as his results agree exactly with Le Verrier's figures.—On the deformation of surfaces, by M. Paul Adam.—A correction to be applied to readings of metastatic thermometers, by M. Scheurer-Kestner. The correction discussed is to be applied to the Walferdin or Beckmann thermometer to allow for the mercury in the upper reservoir, which is for the time being inactive as regards expansion shown on the scale.—Study on the latent heats of vaporisation of fatty ketones, of octane and decane, and of diethyl and dimethyl carbonates, by M. W. Longuinine. With regard to Trouton's formula $\frac{MS}{T}$ = a constant (where M is the molecular weight of the substance, S is its latent heat of vaporisation, and T its absolute boiling point), the results so far obtained warrant the general conclusions: (1) For each of the groups that have been studied $\frac{MS}{T}$ is very nearly constant. (2) It varies notably for different groups of substances. Latent heats may be calculated by the general mean value given to the constant within 15 per cent., and by the value obtained from a determination by means of a substance of the same type within 1·5 per cent.—Peroxidised potassium derivatives of benzoquinone, by M. Ch. Astre. Benzoquinone contains only two atoms of hydrogen in its molecule replacable by a metal. The diketonic nature of benzoquinone is supported by the author's results.—On the composition of rice imported into France, by M. Balland.—On the toxicity of acetylene, by M. N. Gréhant. Acetylene is poisonous when it occurs in air to the extent of 40 to 79 per cent., but is not nearly so injurious as ordinary lighting gas. M. H. Moissan added that pure liquefied acetylene possesses an agreeable ethereal odour, and causes no inconvenience when breathed in small quantity.—Serotherapy in the treatment of cancer, by MM. J. Héricourt and Ch. Richet.—On a new Lamellibranch (*Scioberetia australis*) commensal with an Echinoderm, by M. Félix Bernard.—On the age of the lignite formation of Southern Chili, the Auracaria group, the Chilian equivalent of the Laramie and Chico-Tejon group of North America, by M. A. F. Noguès.—On the daily variations of relative humidity, by M. D. Eginitis.—On new observations in the Padiriac chasm (Lot), by M. E. A. Martel.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Elementary Physics: J. Henderson (Longmans).—The People of the Moon: T. Carter (*Electrician* Company).—An Account of Palmyra and Zenobia: Dr. W. Wright (Nelson).—Rambles in Japan: Dr. H. B. Tristram (R.T.S.).—Technical Educator, Vols. v. and vi. (Cassell).—Birds of Berwickshire: G. Muirhead, Vol. 2 (Edinburgh, Douglas).—Practical Trigonometry: H. Adams (Whittaker).—The Valley of Kashmír: W. R. Lawrence (Froude).—Atlas of the Fertilization and Karyokenesis of the Ovum: Drs. Wilson and Leaming (Macmillan).

PAMPHLETS.—Anleitung zur Molekulargewichtsbestimmung: Dr. G. Fuchs (Leipzig, Engelmann).—Ueber den Zusammenhang Zwischen der Erdmagnetischen Horizontalintensität und der Inclination: Dr. H. Fritsche (St. Petersburg).—Compte Rendu des Travaux de la Société Helvétique des Sciences Naturelles réunie a Schaffhouse, 1894 (Genève).—Congrès de la Science de l'Atmosphère, Anvers, 16-18 Aout 1894, Communications: A. Lancaster (Anvers).

SERIALS.—Tufts College Studies No. 4 (Tufts College, Mass.).—Zeitschrift für Wissenschaftliche Zoologie, lx. Bd. 1 Heft (Leipzig, Engelmann).—Studies in Biology from the Biological Department of the Owens College, Vol. 3 (Manchester, Cornish).—Good Words, November (Isbister).—Sunday Magazine, November (Isbister).—Longman's Magazine, November (Longmans).—Journal of the Royal Microscopical Society, October (Williams).—Mitteilungen der Naturforschenden Gesellschaft in Bern, Nr. 1335-1372 (Bern).—Verhandlungen der Schweizerischen Naturforschenden Gesellschaft, 1893-94 (Schaffhausen).—Scientific Transactions of the Royal Dublin Society, Vol. v. series 2: The Papillary Ridges on the Hands and Feet of Monkeys and Men: D. Hepburn (Williams).—Humanitarian, November (Hutchinson).—Astrophysical Journal, October (Wesley).—Natural Science, November (Rait).

CONTENTS.

	PAGE
The Centenary of the Institute of France	637
The Gold Mines of the Rand. By Bennett H. Brough	638
Starch. By Prof. H. Marshall Ward, F.R.S.	640
Applied Meteorology. By W. E. P.	641
Our Book Shelf:—	
Scherren: "Popular History of Animals for Young People"	642
Bower: "Simple Methods for Detecting Food Adulteration"	642
Letters to the Editor:—	
Introduction of a West Indian Frog into the Royal Gardens, Kew.—Dr. Albert Günther, F.R.S.	643
The Cause of an Ice Age.—Dr. E. W. Hobson, F.R.S.	643
Green Oysters.—Dr. D. Carazzi	643
Oxford Endowments.—R. E. Baynes; Prof. Sydney J. Hickson, F.R.S.	644
Late Leaves and Fruit.—J. Lloyd Bozward	644
The Centenary Fêtes at Paris. By Dr. Henri de Varigny	644
History of the Institute of France. By M. Jules Simon	645
"Barisàl Guns" and "Mist Pouffers." By Prof. G. H. Darwin, F.R.S.	650
Notes	650
Our Astronomical Column:—	
Rutherfurd's Stellar Photographs	655
Radial Velocities of Saturn	655
The Cape Observatory	655
The Institution of Mechanical Engineers	655
Recent Fishery Literature	657
The Formation of Bacterial Colonies. By Prof. H. Marshall Ward, F.R.S.	658
University and Educational Intelligence	658
Societies and Academies	659
Books, Pamphlets, and Serials Received	660

BIBLIOTEKA GŁÓWNA POLITECHNIKI WSI