

and the tendency to retain this energy in the form of derived compounds in which the carbon is proportionately accumulated.

Let us consider this endowment of energy of plants from a point of view more nearly that of the subject of these remarks—viz. the formation of the seed in an annual. We take it that every cell is impressed with the striving, so to speak, to bring about this result. In regard to the energy necessary, again we may conceive a storing up in the earlier processes of elaboration, together with a continuous supply from the external world. Supposing, now, the organic existence of the plant arrested by cutting during the period of inflorescence; the one supply is cut off, but what becomes of the other, the intrinsic energy and tendency of the organised matter in this direction? Analogy leads us to conclude that it flows on, expending itself on an unattainable end, until it fails from failure of the co-operative supply.

Now if this account of the relationship of the matter and energy of plants is generally true, we think they demand first consideration at the hands of investigators of ensilage. Mr. Fry attributes the rise of temperature in the silo to "intercellular oxidation." We think the term a good one, as it points to intrinsic oxygen exchanges. But we gather from the context that the oxidation referred to is at the expense of atmospheric oxygen. We think this qualification weakens the value of the term in diverting attention to a cause inadequate to produce the result. How much oxygen is contained or is supplied to the silo? Supposing it completely burned to carbonic anhydride and all the resulting heat effective in raising 100 times its weight of water 30° C. in temperature, is this sufficient on the most favourable calculation to raise the whole mass to 60°–70° C., the temperature which usually obtains? Why does the temperature continue to rise for some weeks after the crop has been ensiled, when from all causes the supply of oxygen must continually diminish? Apart from these considerations the conditions of the matter in the pit are surely unfavourable to oxidation by atmospheric oxygen, chiefly in the impediments to gaseous circulation and the absence of light. As we wish to confine ourselves to suggestions and to avoid statements of opinion, we do not hazard any conclusions on this point, but we ask for a comparison of the considerations drawn from the study of the intrinsic energy of plants with those from their relationships to the external world, in regard to this first phenomenon of the silo.

In regard to Mr. Fry's theory of "intercellular fermentation," we again think the term conveys a wider truth than his exposition. As an agriculturist he recognises two main kinds of ensilage products—sweet and sour—and we have already alluded to his account of their production.

Now, on what does this terminology turn, in as far as it is correlated with the chemical composition of the silage? Upon quantities of certain constituents which are a small fraction of the whole. It is, on the other hand, an axiom with the chemist, in his study of reactions, not to be led away by issues which are obviously subordinate. From a number of considerations which follow directly from the previous discussion, the cellulose fabric of the plant studied comparatively with the changes which it undergoes in the silo, is best calculated to throw light on the general nature and tendency of these changes. These changes involve a commerce of molecules, if we may use the expression, of which the appearance of small quantities more or less of particular acids or other compounds are minor results. We prefer the term "intercellular commerce" as less specialised than "fermentation"; and in so far as the problems involved are essentially chemical, we think a study of the matter changes from this point of view in the order pointed out by relative quantity and permanence of relationship to the plant

structure, is better calculated to elucidate the nature of these transformations.

In regard to sour ensilage, and the view of it as resulting from bacterial fermentation, we have little to say. The study of the life of such organisms under the very peculiar circumstances of the silo has been thus far very slender. From the later researches of Nägeli and others, which have considerably modified the theory of anaerobic fermentation as propounded by Pasteur, we are inclined to attach less weight to this probable factor of the changes in the silo than Mr. Fry.

Generally speaking, and as he admits, the whole subject needs a very exhaustive investigation, and as we would point out, on the widest basis, and altogether independently of its special bearings upon agriculture. The scientific method must be followed, even though in particular experiments the silage were rendered unfit for food. The factors of the result must be caused to vary artificially that their influence may be severally measured. The silo may be heated in any suitable way, the organic matter may be sterilised as regards parasitic germs, substances may be added to modify the reactions, and many other and similar self-suggestive means employed to test particular issues. In conclusion we revert to our original text, and we congratulate Mr. Fry on having laboured well in a good cause. As an agriculturist he has exceeded in his investigations what was to be expected; but in his endeavour to give a scientific account of the silo simultaneously with the agricultural, we think he has disposed of the complications of the subject by repressing their consideration. It is to the somewhat thankless task of reproducing certain of these that we have addressed ourselves, with the view, as already stated, of aiding to keep the subject in its true perspective.

NOTES

THOMAS DAVIDSON, LL.D., F.R.S., of Muirhouse, Midlothian, died, from an attack of lung disease, at West Brighton, on the 16th inst., in his sixty-ninth year. Dr. Davidson, who was so well known in the scientific world, more especially for his work on the "Fossil Brachiopoda," was a Fellow of the Royal, the Geological, and many other learned Societies, foreign as well as British. In 1851 he began his description of the "British Fossil Brachiopoda," which has been published from year to year by the Palæontological Society, the concluding supplements having appeared in the last volume of that Society in December 1884. Numerous memoirs on similar subjects have been published in the *Transactions* of several scientific Societies. Recently Dr. Davidson prepared a "Report on the Brachiopoda dredged by H.M.S. *Challenger* during the Years 1873–76." At the time of his death he was engaged upon a further monograph on recent Brachiopoda, the first part of which is now appearing in the *Transactions* of the Linnean Society. Dr. Davidson latterly resided at Brighton, and notwithstanding his other scientific avocations he devoted a considerable portion of his time to the perfecting of the town museum.

PRESIDENT CLEVELAND'S invitation to Prof. Agassiz to assume the direction of the United States Coast Survey has been hailed in America as an assurance that the new administration will encourage scientific work, and is not indifferent to survey, but is desirous of placing it under a head whose name and character would be a guarantee of success. The health of the Professor precluded his acceptance of the post; but beyond this he is of opinion that the guidance of the Coast Survey requires an expert. The problems to be decided, the methods to be employed, the men to be engaged, should, he thinks, be determined by one who knows the business. Any other person would be in danger of failure. In concluding an article on the subject *Science* says:—"The correspondence of Secretary Man-

ning and Prof. Agassiz is to us an assurance that science will not be retarded, and that scientific men will not be slighted by any act of President Cleveland."

Science comments in a recent issue on an extraordinary statement published in certain New York and Boston journals to the effect that a committee which had been appointed to investigate the geological survey of the United States had found that illegal practices prevailed in the work of that department. It appears that no such committee ever sat; the whole was pure fiction. There was no report, no illegal proceedings, no examination. The officer to whom it was said the committee made this report has no authority to appoint or superintend such a committee, and the whole story had its origin in the fertile brain of an imaginative newspaper correspondent. It is well that this should be understood in this country, in case the baseless statements referred to should have made their way here.

THE Annual Meeting of the London Mathematical Society will be held on Thursday evening, November 12, and will be made special for the purpose of considering alterations in the rules, which will be proposed by the Council. At the same meeting it will be proposed to elect Mr. C. Leudesdorf and Capt. P. A. Macmahon, R. A., as new members of the Council in the place of Dr. Hirst, F.R.S., and Mr. R. F. Scott, who retire.

THE following are the conclusions of the Scientific Commission appointed by the Spanish Government to examine Dr. Ferran's method of treating cholera patients. They are abbreviated by the special correspondent of the *Times* in the cholera districts of Spain, writing from Valencia on October 12: (1) Dr. Ferran's inoculations cannot be considered inoffensive. (2) The attenuation of the comma bacillus has not been demonstrated. (3) The prophylactic measures conceived by Dr. Ferran are empiric, for they are in no wise governed by scientific rules or laws. (4) By means of the vaccination the epidemic is propagated. (5) It is not demonstrated by the results ascertained that the inoculations secure immunity from cholera. (6) The individual during the first days following his inoculation is rendered more susceptible to contract any other form of disease. (7) This is due to the fact that the inoculation disturbs more or less profoundly the physiological equilibrium which it is so necessary to maintain during a period of epidemics. (8) The results as seen by the Commission do not prove immunity from cholera. Neither is it possible to obtain conclusions from statistics relating to inoculations, because general laws cannot be deduced from isolated facts.

DR. QUAIN delivered the Harveian oration on Monday afternoon before the Royal College of Physicians. He set himself to answer two questions: first, why it is that among a vast number of persons, alike in ancient and in modern times, medicine has not enjoyed that high estimate of its value, as an art and as a science, to which it is justly entitled; and, secondly, whether we have any grounds for anticipating a more satisfactory future for medicine, either in the security of the foundations on which it is laid, or in the consequent appreciation of it by the public. In the course of the oration Dr. Quain spoke of the progress of medical science before the foundation of the College of Physicians; the advances made in our knowledge of etiology, especially in the practice of arresting the diffusion of disease by limiting the spread of contagion, and of improvements in our knowledge of pathology. Having pointed out the progress which science and art have made in every direction, Dr. Quain produced statistical evidence that the improvement has been productive of substantial results. In answer to the second question he quoted the words of "one of the most eminent of our statesmen," to the effect that in a generation or two the medical profession would be far in advance of the other learned professions."

WE lately quoted in *NATURE*, with a comment on the exceedingly unusual character of such an announcement from America, a statement to the effect that the Astronomical Observatory of Beloit College was being closed on account of want of funds. We are very pleased to learn from *Science* that this statement is quite erroneous. On the contrary, Prof. Bacon, the Director of the Observatory, states that new arrangements have been made for carrying on additional observations in meteorology, and that especial attention will be paid to solar and spectroscopic work with greater facilities than before. This, we may observe, is happily by no means a surprising or novel announcement from across the Atlantic.

THE new School of Metallurgy which has recently been added to the Birmingham and Midland Institute, was formally opened on September 24, when Prof. Chandler Roberts, F.R.S., delivered a lecture on the Development of Technical Instruction in Metallurgy. Prof. Roberts pointed out how very recent has been the introduction into this country of systematic instruction in metallurgy. After referring to the important share which Dr. Percy has had in the development of metallurgical work in England, and to the steps taken by the Committee of Council on Education for its practical working, Prof. Roberts insisted on the importance of combining theory and practice, and referred at length to the methods adopted in the School of Mines. A full report of Prof. Roberts' lecture will be found in the *Chemical News* of October 9.

THE increasing efficiency with which electric lighting can be applied has recently been shown by Messrs. Woodhouse and Rawson, who, at a *soirée* at Guy's Hospital, lit up the building with their incandescent lamps, worked off Faure Sellen accumulators, which were only delivered on the morning of the *soirée*. Equally efficient was the lighting supplied by the same firm at the Leicester Exhibition of the Sanitary Institute of Great Britain. It is certainly a great convenience that such temporary illuminations can be effected under almost any conditions.

IN an article on the use of the French Academy, *Science* says:—"But, aside from all personal considerations, there remains a question whether an organisation like the French Academy may not perform an important service to the country by giving its collective authority to the encouragement of excellence in the use of language. May not its criticism of its own members, its judgment of works presented to it, its bestowal of academic honours, its election of associates, its public discourses, and its serious scrutiny of the vocabulary and phraseology of the language in their combined influence, be a very powerful agency in the promotion of literary excellence? May it not become a sort of schoolmaster to the nation, incapable of making good writers out of bad, but helpful in discipline? Who can tell what has been the net gain to France from such a society? Is the clearness, the precision, the symmetry, the finish of a good French style worth having? What would the German language be to the world if there had been a German academy at work for 250 years smoothing its roughness and insisting upon clear, unencumbered, and pleasing forms of expression?"

THE Calendar of the University College of North Wales, at Bangor, has just been published. Besides the usual information, examination papers and lists, it contains a brief sketch of the establishment of this college, which now enters its second year, and which promises to have a success worthy of the efforts by which it was founded. The thirst of the Welsh people for knowledge and for the education of their children is well known, and the introduction to the "Calendar" states that never before in so short a period have so many persons, either in England or in Wales, subscribed towards a movement for the promotion of higher education. In twelve months the list rose

to upwards of 30,000*l.*, and by the end of 1884 it had exceeded 37,000*l.*

WE have received Prof. Rockwood's account of the progress in vulcanology and seismology in the years 1883, 1884, from the Smithsonian Report for 1884. Under Vulcanology he treats of the volcanic eruptions during the two years (dealing mainly with the Krakatoa eruption), and of the investigations of former volcanic activity. In seismology he divides his subject into earthquake lists of 1882 and 1883, special earthquakes of 1883 and 1884, lists of former earthquakes, and theories of earthquakes. In seismometry Prof. Rockwood deals with instruments and their records. The pamphlet, which should be a *vade mecum* for all engaged in investigating seismic phenomena, concludes with a bibliographical list of all the books and papers relating to the subject, which appeared during the two years under review. This list is surprising for its length and variety.

VUIBERT'S *Journal de Mathématiques Élémentaires*, which has had an existence of nine years in a lithographed form, commences its tenth year in print. It may be called the French schoolboys' mathematical journal, for it is addressed specially to them, and all the solutions are contributed by them. It appears fortnightly from October 1 to July 15, and the terms of subscription are very moderate. We have unfortunately in this country nothing to correspond to it, and it may therefore be useful to signalise its existence to mathematical masters.

AT a meeting of the Council of the National Fish Culture Association held on Friday last under the presidency of the Marquess of Exeter, it was resolved to take immediate steps to conduct a series of investigations and observations on the ocean in regard to its temperature at various depths; also as to the habits of fish, their spawning grounds, their enemies, and the cause of their erratic migrations. The Duke of Edinburgh, it was stated, had much interested himself in the subject, and had obtained the cooperation of the Admiralty and Trinity Board in aiding the Association to carry out the observations with the view of promoting marine fish culture and undertaking it on a thoroughly scientific basis.

THE Severn Fishery Board have made arrangements with the National Fish Culture Association to incubate salmon ova. When hatched out the fry will be placed in the waters under the control of the Board, which is doing its utmost to cultivate all species of Salmonidæ. The National Fish Culture Association will, it is understood, render similar service gratuitously to other Boards, in order to assist in developing the inland fisheries of the United Kingdom.

THE Institute of Chemistry has obtained a Royal Charter of Incorporation from the Privy Council, and it is intended to celebrate the occasion by a dinner on November 6.

THE following Penny Science Lectures will be given at the Royal Victoria Hall and Coffee Tavern, Waterloo Bridge Road, during the ensuing weeks.—On Tuesday, October 27, Mr. W. D. Halliburton will lecture on the "Circulation of the Blood"; on Tuesday, November 3, Sir John Lubbock will lecture on "Ants"; on Tuesday, November 10, Mr. W. Lant Carpenter will lecture on "Electrical Fire Alarms in America."

A SHOCK of earthquake was felt at half-past seven o'clock on the morning of the 13th in Granada and the surrounding country. The movement is described as a long trepidation, with a rumbling noise. At Palermo a shock occurred on the morning of the 15th. A house, three storeys high, fell in, and a number of persons were buried in the *débris*.

IN connection with the General Italian Exhibition held in Turin last year, the Italian Meteorological Society has just issued an interesting *brochure* on the present state of astronomical,

physical, and meteorological studies in the peninsula. In these departments the show was thoroughly national, special prominence having been given to those branches which are at present most widely cultivated in Italy. Thus in terrestrial physics full scope was given to seismology, vulcanology, and geodynamics, all which studies, owing to the special local conditions, have here been associated with some of the most illustrious names in science. Meteorology was well represented by specimens of the best apparatus from the chief meteorological stations in the country, and in astronomy the progress of all the local observatories was fully illustrated. Amongst the objects on view were astronomical, physical, and meteorological apparatus; charts, maps, designs, photographs; printed and manuscript works on these subjects. Although still far behind some other countries in the production of scientific instruments, the display showed that in recent times Italy has made considerable progress in this branch of mechanics. To illustrate the history of these sciences the exhibition included some curious old instruments associated with the names of illustrious pioneers, who laboriously prepared the way now followed by their more fortunate successors living in better times and enjoying the advantage of more perfect appliances. The pamphlet contains a complete list of the ninety-one meteorological and geodynamic stations already established throughout the peninsula, as well as the names of exhibitors, to whom diplomas, gold and silver medals, and other distinctions were awarded.

MR. MELLARD READE'S presidential address to the Liverpool Geological Society was on "The North Atlantic as a Geological Basin." After discussing the form and nature of the ocean-bed so far as is disclosed by the latest soundings and dredgings, he pointed out that all along the coast of Spain and North Africa the bottom was exceedingly irregular, as proved by the soundings for the telegraph cables, consisting apparently of mountains and valleys. On the opposite coast of South America, and especially about the mouths of the Amazons, the soundings were comparatively shallow and of nearly uniform depth. Taken together with the known great depth of alluvial deposits at the mouths of all the great rivers where borings had been made, and the undoubted great age of the Amazons Basin, Mr. Reade arrives at the opinion that this plateau is a submarine extension of the delta proper, consisting of geologically modern sediment probably thousands of feet thick. The same reasoning, he points out, will apply to other great rivers and coasts where similar conditions exist.

FROM a series of experiments by Herr Graber, relating to the effects of odorous matters on invertebrate animals, it appears probable that in the case of many insects neither the antennæ nor the palpi can be absolutely pronounced the most sensitive organ of smell, inasmuch as the one organ is most sensitive for some odorous matters, and the other for others.

THE additions to the Zoological Society's Gardens during the past week include a Purple-faced Monkey (*Semnopithecus leucoprymnus* ♀) from Ceylon, presented by Major Norris; a Rhesus Monkey (*Macacus rhesus* ♀) from India, presented by Mr. J. H. Fielding; a Common Marmoset (*Hapale jacchus*), a Black-eared Marmoset (*Hapale penicillata*) from Brazil, presented by Miss Knowles; a Common Marmoset (*Hapale jacchus*) from Brazil, presented by Lady Cowley; a Common Hare (*Lepus europæus*), British, presented by Mr. F. J. Allpress; a Mexican Souselik (*Spermophilus mexicanus* ♂) from Mexico, presented by Dr. Stuart; a Herring Gull (*Larus argentatus*), British, presented by Mr. J. G. Taylor; a Macaque Monkey (*Macacus cynomolgus* ♂) from India, a Green Monkey (*Cercopithecus callitrichus* ♀) from West Africa, deposited; an Ariel Toucan (*Ramphastos ariel*) from Brazil, purchased; a Hoolock Gibbon (*Hylobates hoolock* ♀), received in exchange.