smaller. The Wehnelt kathode gives the line without placing pieces of metal in the tube, so that in this case nothing is bombarded by the kathode rays but the glass walls of the tube; the strip of metal forming the kathode is, however, bombarded by the positive rays.

The 3 line when present at all continues even though the bombardment is very prolonged. In some cases the bombardment has been prolonged for twenty hours, and at the end of that time the line seemed almost as bright as at the beginning; indeed, I could not feel certain that there was any difference. This might lead one to suspect that X_3 was manufactured from the lead or other metal by the bombardment rather than stored up in it, and this view might be regarded as receiving some support from the fact that very little of the X_3 is liberated by heating. The following experiment is an illustration of this. I took a piece of lead, and instead of bombarding it with kathode rays I placed it in a quartz tube connected with vessel A, and heated the tube to a bright red-heat for several hours. Large quantities of CO_2 and hydrogen were driven off by this process; this was absorbed by charcoal, and the residual gases, which had accumulated in A, were admitted into the vessel B; the X_3 line and helium line could just be detected, and that was all. I then gave the lead a second heating, raising this time the temperature until the quartz was on the point of softening. The lead was boiling vigorously; the heating was kept up for about three hours. In this time about three-quarters of the lead had boiled away. I then let the gases which had been given off at the second heating into the vessel B, and took another photograph; no trace of the line due to X_3 or helium could be detected. The fraction of the lead which had not been boiled away was now placed in A and bombarded by kathode rays. It now gave the 3 line quite distinctly; the helium line was visible, but faint. By the bombardment with the kathode rays the lead was only just melted, so that the average temperature was much less than when it was heated in the quartz tube. This rather suggests that the X_3 might be due to a kind of dissociation of the metal by the kathode rays, and not to a liberation of a store of that substance. Another experiment shows, however, that for lead, at any rate, this view is not tenable. I took some lead which had just been deposited from a solution of lead acetate by putting a piece of zinc into the solution, and forming the well-known lead-tree. When I bombarded this freshly precipitated lead, I could get no trace of the X_3 line; the helium line, too, was absent. I then tried another experiment. I took a piece of lead and divided it into two parts. The first of these I bombarded by the kathode rays: it gave the X_3 line quite distinctly. The other part I dissolved in boiling nitric acid, getting lead nitrate. The nitrate was heated and converted into oxide, and this was bombarded by the kathode rays: it did not give the X_3 line, showing that the X_3 is not produced by the bombardment, but is something stored up in the lead, which can be detached from it when the lead is dissolved. I have tried several samples of lead; the one which gave the X_3 line most distinctly was a piece of lead from the roof of Trinity College Chapel, several hundred years old. A sample of Kahlbaum's chemically pure lead, which must, I suppose, at no distant date have been subjected to severe ordeals by fire and water, showed the line quite distinctly, though not so well as the older lead. I have tried similar experiments with iron, and found that iron which gave the 3 line very distinctly ceased to do so after it had been dissolved in acid.

As the most obvious explanation of X_3 is that it is H_3, bearing the same relation to hydrogen that ozone does to oxygen, and produced in some way from the hydrogen dissolved in the metal, I tried if I could produce it by charging metals with large quantities of hydrogen, and then seeing if the hydrogen coming from the metal gave any traces of H_3. Thus, for example, I tested the hydrogen given off from hot palladium, but found no trace of X_3. I then charged nickel at a temperature of about 355° C. with hydrogen in the way recommended by Sabatier, but found no increase in the brightness of the X_3 over nickel that had not been deliberately exposed to hydrogen. I tried if the brightness of the line would be increased by adding hydrogen to the bulb A, in which the bombardment took place, but found no effect. I also tried adding oxygen to this bulb, thinking that if it was H_3 it would combine with the oxygen, and thus be eliminated, but no great diminution in the intensity was produced by this treatment. The gas seems quite stable, at least it can be kept for several days without suffering any diminution that can be detected; indeed, when once it has got into a bulb, there is considerable difficulty in getting the bulb free from it. It must be remembered, too, that by the method by which it is produced the gas is subjected all the time to electric discharges which would break it up unless it possesses very great stability. Thus if X_3 is a polymeric modification of hydrogen, it must possess the following properties:—

(1) It must be very stable.

(2) it must resist the action of oxygen.

(3) It must not be decomposed by long-continued exposure to the electric discharge.

These are properties which *a priori* we should scarcely have expected an allotropic modification of hydrogen to possess.

Mendeléef predicted the existence of an element with an atomic weight 3. According to him this element should be intensely electro-negative and possess the properties of fluorine to an exaggerated extent. The gas X_3 can, however, be kept in glass vessels, which we should not expect to be possible if it possessed more than fluorine's power of combining with glass. I prefer to defer expressing any opinion as to the actual nature of the gas until I have had the opportunity of making further experiments upon it. It is only about two months ago that I found how to get the gas with any certainty, and, as the method involves long bombardments, each experiment takes a considerable time. This has prevented me from making several experiments which suggest themselves, and which ought to be made before coming to a final decision. I thought, however, that the investigation, though incomplete, might not be unsuitable for a Friday evening discourse, as the gas, whatever its nature, is certainly one of considerable interest, and its detection illustrates the delicacy of this new method.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Sudbury-Hardyman prize offered for an original dissertation by a graduate member of Emmanuel College under the standing of M.A. has been increased to 40*l*., and divided between G. E. K. Braunholtz, formerly scholar and research student, and R. D. Vernon, research student. Mr. Braunholtz's dissertation was "The Nomina of Italy, peculiar to Gallia Transpadana," and Mr. Vernon's "The Geology and Palæontology of the Warwickshire Coalfield."

THE electors to the Michael Foster research studentship in physiology give notice that there will be an

election to the studentship in the year 1913. Candidates are required to send in their applications to the professor of physiology before the end of June, with a statement of the course of research which they propose to undertake.

The Board of Agricultural Studies, in consultation with the president of the Royal Agricultural Society, has nominated C. R. Fay to be the Gilbey lecturer on the history and economics of agriculture.

The General Board of Studies is authorised to appoint a University lecturer in agricultural physiology for a further period of five years from midsummer, 1913. The lecturer will receive an annual stipend of 200*l*., payable out of the agricultural education fund.

LEEDS.—Mr. W. A. Millard, formerly assistant lecturer in botany, has been appointed lecturer in agricultural botany.

A series of week-end lectures on modern Germany will commence on May 31, and will be continued on June 6, 7, and 14. Among the lecturers will be Dr. Hiby, managing director of the Otto Coke Oven Co., on industrial and social conditions; Prof. Smithells, on the story of German science; and Mr. J. L. Paton, on modern German education.

MANCHESTER.—The council has made a number of appointments and rearrangements in the department of chemistry consequent on the resignation of Prof. W. H. Perkin on his acceptance of the chair of chemistry at Oxford. Dr. A. Lapworth, F.R.S., has been appointed professor of organic chemistry and Dr. Charles Weizmann has been appointed reader in biochemistry and lecturer in colouring matters. Dr. E. C. Edgar and Dr. F. B. Burt have been made senior lecturers in chemistry. Prof. H. B. Dixon has been reappointed director of the chemical laboratories, to supervise the department as a whole.

Mr. Edward Sandeman has been appointed associate professor of engineering in the University. He will lecture on water supply and irrigation, and will be responsible for the studies of all students specialising in this branch of engineering.

OXFORD.—The fourth Halley lecture was delivered in the schools on May 22 by Dr. Louis A. Bauer, director of the department of research in terrestrial magnetism in the Carnegie Institution of Washington, U.S.A. The subject of the lecture was "The Earth's Magnetism." Dr. Bauer paid a tribute to Halley as one of the greatest among early investigators of the variations of the compass. He described the two years' cruise undertaken by Halley in the years 1698–1700, at the cost of William III., for the purpose of making magnetic observations. The expedition which left New York four years ago in the *Carnegie* had followed the same track, but found a great alteration in the magnetic conditions. The magnetic poles were gradually shifting. Though Halley's theory of terrestrial magnetism was not strictly correct, it seems to have been the first definite recognition of the complexity of the problem. This would not be completely solved until the physicists were able to answer the question, What is magnetism?

A valuable lecture on wireless telegraphy has been given before the Ashmolean Society by Mr. W. G. Gill, of the Officers Training Corps and fellow of Merton College.

Entries for the Final Honour School in Natural Science number eighty-nine, distributed as follows:—Physics, ten; chemistry, thirty-two; zoology, two; physiology, eighteen; botany, five; geology, ten; engineering science, twelve.

On May 27 Congregation passed the preambles of two statutes relating to the holders of professorships at present tenable for life, and to which no canonry is annexed. The statutes provide that every such professor shall vacate office within one year of attaining the age of seventy years, and that a scheme of pensions shall be established to apply to professors vacating office under the above conditions. If these statutes are finally adopted in their present form, they will not apply to any of the present holders of professorships, nor, in all probability, to any of their successors for some years to come. It has, however, been widely felt that some steps should now be taken to provide for the eventual establishment of a satisfactory system of retirement and pension, nothing of the kind being at present in existence.

THE University of Glasgow has received, under the will of Miss Jeanie Pollock, of Glasgow, the sum of 10,000*l*. for providing a materia medica research lectureship.

DR. GEORGE BARGER has been appointed by the Senate of the University of London to the University chair of chemistry tenable at the Royal Holloway College, with the status of appointed teacher.

DR. S. B. SCHRYVER, biochemist at the Research Institute of the Cancer Hospital, Brompton Road, S.W., has been appointed assistant professor of biochemistry at the Imperial College of Science and Technology.

THE board of regents of the University of Nebraska recently voted a general increase in the salaries of deans and professors in the University. *Science* states that the necessary 7000*l*. was obtained from the additional maintenance grant voted by the last legislature.

DR. L. F. GUTTMANN, formerly of London University and the College of the City of New York, and for the last four years assistant professor of physical and industrial chemistry at Queen's University, Kingston, Canada, has been appointed associate professor of chemical engineering in this University.

IT is now announced that the executors of the late Sir J. Wernher, Bart., have completed the allocation of the 100,000*l*. bequeathed to them to be devoted to charitable and educational purposes. 35,000*l*. has been allotted to charitable and educational purposes in South Africa, and the balance of 65,000*l*. has been distributed over nearly 150 different institutions in this country. Among the grants for scientific and educational purposes may be mentioned: to the Institute of Mining and Metallurgy, 5000*l*.; the Imperial Service College, Windsor (to found a scholarship for Bedfordshire), 2500*l*.; the London School of Tropical Medicine, 1500*l*.; and lesser amounts to the London School of Economics, the Bedford College for Women, and the Working Men's College.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, May 7.—Dr. Aubrey Strahan, president, and afterwards Mr. W. Whitaker, in the chair.—M. **Odling**: The Bathonian rocks of the Oxford district. The lithology, palæontology, and stratigraphy of the Bathonian rocks north of Oxford are described, from the evidence afforded by numerous quarries and well-borings and by the Ardley Cutting. The general sequence is given. After a general account of the series, the points of interest in the sections and their relations are described; and it is pointed out that, although no definite zones can be formulated, the different horizons are recognisable by their assemblage of fossils. The chemical and micro-