Twenty-five years ago the number of industrial concerns employing even a single chemist was very small, and even he was usually engaged almost wholly upon routine work. Many concerns engaged in business of a distinctly chemical nature had no chemist at all, and such a thing as industrial research in any proper sense scarcely came within the field of vision of our manufacturers. Many of them have not yet emerged from the penumbra of that eclipse, and our industrial foremen as a class are still within the deeper shadow. Meantime, however, research has firmly established itself among the foundation-stones of our industrial system, and the question is no longer what will become of the chemists. It is now what will become of the manufacturers without them.

In the United States to-day the microscope is in daily use in the examination of metals and alloys in more than 200 laboratories of large industrial concerns. An indeterminate but very great amount of segregated research is constantly carried forward in small laboratories, which are either an element in some industrial organisation or under individual control. An excellent example of the quality of work to be credited to the former is found in the development of cellulose acetate by Mork in the laboratory of the Chemical Products Company, while a classic instance of what may be accomplished by an aggressive individualism plus genius in research is familiar to most of you through the myriad and protean applications of Bakelite. The rapidity of the reduction to practice of Baekeland's research results is the more amazing when one considers that the distances to be travelled between the laboratory and the plant are often, in case of new processes and products, of almost astronomical dimensions.

Reference has already been made to the highly organised, munificently equipped, and splendidly manned laboratories of the Du Pont Company, the General Electric Company, and the Eastman Kodak Company. There are in the country at least fifty other notable laboratories engaged in industrial research in special industries. The expenditure of several of them is more than 300,000 dollars each a year. The United States Steel Corporation has not hesitated to spend that amount upon a single research, and the expenses of a dozen or more laboratories probably exceed 100,000 dollars annually. One of the finest iron research laboratories in the world is that of the American Rolling Mills Company.

The steel industry in its many ramifications promotes an immense amount of research, ranging from the most refined studies in metallography to experimentation upon the gigantic scale required for the development of the Gayley dry blast, the Whiting process for slag cement, or the South Chicago electric furnace. This furnace has probably operated upon a greater variety of products than any other electric furnace in the world. Regarding the steel for rails produced therein, it is gratifving to note that after two and one-half years or more no reports of breakage have been received from the 5600 tons of standard rails made from its output.

Industrial research is applied idealism. It expects rebuffs, it learns from every stumble, and turns the stumbling-block into a stepping-stone. It knows that it must pay its way. It contends that theory springs from practice. It trusts the scientific imagination, knowing it to be simply logic in flight. It believes with F. P. Fish, that "during the next generation—the next two generations—there is going to be a development in chemistry which will far surpass in its importance and value to the human race that of electricity in the last few years—a development which is going to revolutionise methods of manufacture, and more than that, is going to revolutionise methods of agriculture"; and it believes with Sir William Ramsay that "the country which is in advance in chemistry will also be foremost in wealth and general prosperity."

Modern progress can no longer depend upon accidental discoveries. Each advance in industrial science must be studied, organised, and fought like a military campaign. Or, to change the figure, in the early days of our science, chemists patrolled the shores of the great ocean of the unknown, and, seizing upon such fragments of truth as drifted in within their reach, turned them to the enrichment of the intellectual and material life of the community. Later they ventured timidly to launch the frail and often leaky canoe of hypothesis, and returned with richer treasures. To-day, confident and resourceful, as the result of many argosies, and having learned to read the stars, organised, equipped, they set sail boldly on a charted sea in staunch ships with tiering canvas bound for new El Dorados.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The City Council has renewed the annual grant to the University. An amendment by a Socialist member opposing the renewal, on the ground that the elementary education of the city and the technical school were being starved, was defeated by seventy votes to twenty-nine.

Dr. J. E. H. Sawyer has been appointed assistant to the chair of medicine.

Mr. H. A. Scarborough has been recommended to the Commissioners of the Exhibition of 1851 for a research scholarship.

Prof. Bostock Hill is to represent the University at the congress of the Royal Sanitary Institute in July next.

CAMBRIDGE.—The work submitted by Mr. T. W. Price, of Clare College, entitled "Osmotic Pressure of Alcoholic Solutions," has been approved by the Degree Committee of the Special Board for Physics and Chemistry as a record of original research.

OXFORD.—Under the existing constitution of the University, certain seats in the Hebdomadal Council are limited to the heads of colleges and professors respectively. A statute providing for the abolition of "orders" and for throwing the whole of the seats open to members of Convocation of five years' standing, which had been passed by small majorities in Congregation, was submitted in its final stage to Convocation on March 10. The proposed statute was supported by Prof. Geldart, and opposed by the rector of Exeter, and the warden of Wadham. It was rejected on a division by 97 to 83.

The preamble of a statute providing for the establishment of an additional professorship of chemistry, to be called "Dr. Lee's Professorship," passed Congregation without a division.

THE presentation of the portrait of Sir William Ramsay, K.C.B., to University College, London, and of the replica to Lady Ramsay, will be made on Wednesday next, March 18, at 4.30, in the Botanical Theatre.

THE appeal made by Girton College for 8000*l.* by January 1, 1914, to meet conditional promises of 12,000*l.* from an anonymous benefactor and 4000*l.* from Rosalind Lady Carlisle, has been completely successful, and the purpose of the appeal, which was the extinction of a mortgage debt of 24,000*l.*, has now been achieved. The donation, we learn from the

Times, included 1000*l.* from the Drapers' Company and 500*l.* from the Clothworkers' Company.

THE presidency of Johns Hopkins University, Baltimore, which has been vacant since the resignation of Dr. Ira Remsen in 1912, has been filled by the appointment of Dr. Frank J. Goodnow, recently professor of administrative law at Columbia University, New York. In choosing an expert in this subject to succeed a chemist, Johns Hopkins has precisely followed the example of Harvard a few years ago, when Prof. A. Lawrence Lowell took the place of Dr. C. W. Eliot.

THE Local Lectures Summer Meeting will be held this year at the University of Cambridge on July 31–August 24. The new University examination halls and lecture-rooms will be used. The inaugural lecture will be delivered at 8 p.m. on July 31 by Sir J. J. Thomson. The lectures will be grouped round the general subject, "Some Aspects of Modern Life," and among the courses announced we notice one by Dr. L. Doncaster on heredity in animals and man. Forms of entry and further information about the meetings will be supplied by the Rev. Dr. Cranage, Syndicate Buildings, Cambridge.

LAST year Messrs. Harrods, Ltd., established a scheme of scholarships providing the holders with a year's training at their stores in commercial English, handwriting, arithmetic, French or Spanish, shorthand, typewriting, business routine, and salesmanship, with free meals. The scholarships are awarded on the nomination of shareholders; the nominees must be between the ages of fifteen and eighteen years, have had a fair education, and be able to pass a medical examination. They will secure a commercial education in which practice and theory will be combined; for the mornings are given to class instruction, and the afternoons to work in the departments, the holder of a scholarship being attached to a different department each month. This arrangement has worked admirably during the past year. Fifty scholarships will be available in September next, and the test examination for the nominees will be held in June or July. Messrs. Harrods' enterprise in establishing this system of training young people in the principles and practice of business-building is to be commended, and we believe it will achieve notable success.

AN article in the *Westminster Gazette* of March 3, by the Berlin correspondent of our contemporary, reveals a growing demand in Germany for more universities. It is alleged that existing universities are overcrowded owing chiefly to the invasion of foreign and of women students, and the more general need of university education for officials. The number of such institutions is smaller than it was a century ago. Cologne, Trier, Duisburg, Helmstedt, Wittenberg, Frankfurt-on-Oder, Mainz, Erfurt, Altdorf, and Ingolstadt have all been university towns. Since the empire was founded the number of students has increased fourfold. In 1880 there were 30,000 students; in 1905, 42,000; and last year more than 60,000. There are 5300 foreign and 3500 women students, and about 4000 non-student auditors. The agitation for new universities came to a head last year when Hamburg, Frankfurt-on-Main, Dresden, Posen, Cologne, and some smaller towns proposed to establish universities. The impulse in some cases was the desire of existing special and technical high schools to expand into universities with full university status, but with a reduced number of faculties. The advocates of new universities complain that the universities have recognised with ill-will the increasing specialisation of science; and that specialisation is now hopelessly ahead of them. Some reformers want not only specialisation within universities, but specialisation of the institutions themselves. Each university, while keeping its faculties and its general culture system, should aim at a predominant position in a particular branch of science; and should be specially well supplied with professorial chairs, seminaries, libraries, and collections bearing on its speciality.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 5.—Sir William Crookes, president, in the chair.—Harold **Wager**: The action of light on chlorophyll. When chlorophyll is decomposed by light, at least two distinct substances are formed, one of which is an aldehyde or mixture of aldehydes, and the other an active oxidising agent, capable of bringing about the liberation of iodine from potassium iodide. The decomposition of chlorophyll appears to be due directly to the action of light and is not an after effect of the photo-synthesis of carbon dioxide and water. It takes place only in the presence of oxygen, and it appears to be a case of photo-oxidation, for oxygen is used up so completely in the process that chlorophyll can be used instead of pyrogallol and caustic potash to determine the amount of oxygen in a given amount of air. In the absence of oxygen no bleaching takes place. Carbon dioxide is not necessary to the photo-decomposition of chlorophyll and is not used up in the process, even when present in considerable quantities. —C. H. **Warner**: Formaldehyde as an oxidation product of chlorophyll extracts.—Franklin **Kidd**: The controlling influence of carbon dioxide in the maturation, dormancy, and germination of seeds. Experiments are described showing that germination of seeds can be completely inhibited by carbon dioxide in the atmosphere (20–30 per cent., varying with the temperatures used). This inhibition is not accompanied by injury. The seeds germinate at once after removal from inhibitory CO_2 pressures. Experiments in the field showed that this action of CO_2 may actually occur in nature. If a quantity of green plant material is buried deep in the ground, seeds planted in the soil over this decaying material are inhibited in their germination by the CO_2 produced beneath them. This is of agricultural significance, and the fact that in the case of mustard seeds suspension of vitality continues, even after the external CO_2 has been removed, suggests an explanation of the common occurrence of dormant seeds of this plant in fields, and possibly of other natural cases of delayed germination. —J. **Hammond** and F. H. A. **Marshall**: The functional correlation between the ovaries, uterus, and mammary glands in the rabbit; with observations on the œstrous cycle.—Dr. J. F. **Gaskell**: The chromaffine system of annelids and the relation of this system to the contractile vascular system in the leech, *Hirudo medicinalis*. The possession of a chromaffine system, consisting of cells which take a yellow stain with chrome salts, is a common property of almost all members of the vertebrate kingdom. The presence of this reaction is coincident with the secretion of the pressor substance, adrenalin, and is probably dependent upon it. Even in the lowest vertebrate, Petromyzon, the system is well developed, being diffusely though segmentally arranged throughout the body. Chromaffine cells have also been observed in certain annelids by Sommet and Poll, reaching their highest development in the Hirudinea; the reaction is given by six nerve cells in each segmental ganglion. The conclusion is drawn