# THE CHEMICAL RESEARCH LABORATORY, TEDDINGTON

THIS year 'open days' at the Chemical Research Laboratory, Teddington, were held during September 19–21, and many representatives of industrial firms, universities, government departments and the Press took the opportunity to view the work in progress. It may be mentioned that a new laboratory is under construction, although it was not open to inspection this year; this is designed for chemical work with radioactive materials and will be ready for occupation during 1952. In addition, plans for a new microbiological laboratory have been drawn up and construction will begin this year. A useful addition to the facilities of the Laboratory is a new glass-working hut, equipped with lathe and other apparatus for high-grade work. Researches were illustrated by many exhibits, and this article is confined to some indication of the general programme of the six research units, and a more detailed description of some of the newer exhibits.

The Corrosion of Metals Group is concerned with corrosion and its prevention in immersed, atmospheric and underground conditions. This includes work on the development of accelerated corrosion tests, the application of inhibitive methods, and new work on boiler-tube corrosion. The Group has a special interest in the surface films on metals, and the chief object of new work on the oxidation of metals below 250° C. is to provide experimental data that may be used to test or formulate theories on the oxidation of metals in this temperature range. In these experiments particular attention has to be paid to the physical and chemical nature of the metal surface employed. The properties of the electrolytically polished surfaces of polycrystalline copper sheet of high purity have been examined by the optical microscope, by electron diffraction and by an electrometric method. The last-named enables the very thin oxide films ($\sim 25$ A.), formed during surface preparation, to be measured and provides a ready means of detecting the presence of certain undesirable contaminating layers on the surface, if they are present. Kinetic studies on the oxidation of these samples at pressures in the range $10^{-1}$–$10^{-4}$ mm. of mercury, using a manometric technique, have revealed that the oxidation-rate is markedly dependent on the oxygen pressure. This variation is of considerable theoretical interest, and a full-scale investigation using a micro-gravimetric procedure is now in progress.

Interesting work on the electrode-potential behaviour of metal specimens in anaerobic culture media inoculated with *Desulphovibrio desulphuricans* has been commenced. In particular, the polarization characteristics of the metals in conditions suitable for the vigorous proliferation of sulphate-reducing bacteria are being studied.

The Radiochemical Group is mainly engaged on a programme of work for the Ministry of Supply on the analysis of radioactive minerals and ores, and the concentration of metals from low-grade sources. A recent advance is the application of ion-exchange resins in separation processes. If a solution containing a mixture of metals is passed through a column of cation-exchange resin, the metals are absorbed in amounts depending on their concentration in the solution and their affinity for the particular resin used. Not only can a dilute solution be concentrated and freed from unwanted anions, but also, by choosing the correct conditions, the process can be selective for a particular metal. An exhibit demonstrated how a multi-column adsorption system can be employed for this purpose. Work on the separation of metals by paper-strip chromatography or cellulose columns has been continued, and a new separation exhibit was that of platinum and palladium from iridium.

The Inorganic Group has been working on a variety of topics, such as the extraction of gallium and germanium from flue dust, and the conversion of rock phosphate into fertilizer by methods designed to reduce the consumption of sulphuric acid. The Group is also responsible for the microanalytical and spectrographic analytical work required by the Laboratory.

Germanium continues to find an increasing use for micro-wave rectification and as a substitute for the triode valve. Considerable difficulty has been experienced in producing material of the necessary high degree of purity, one of the most troublesome impurities being arsenic. The problem has been studied using radioactive tracer methods, and a method of purification has been developed which yields germanium dioxide containing less than 0·01 p.p.m. of arsenic, and which is well suited to commercial application. Germanium metal derived from this oxide has a satisfactory electrical performance. The work is being continued with the view of the elimination of other elements, notably boron, which may be present in minute traces and may affect the electrical properties of the metal.

A feature of the work of the Organic Group is the preparation of organic compounds in a high state of purity and the determination of precise physico-chemical data in collaboration with the National Physical Laboratory; this includes the lower hydrocarbons used for the calibration of mass spectrometers, cyclic and heterocyclic compounds, and long-chain fatty acids. The Laboratory is now equipped with low-temperature distillation units (including a Podbielniak 'Hyd-Robot') for the preparation of pure low-boiling hydrocarbons, and spinning-band fractionating columns for the distillation of the esters of long-chain acids.

Part of the work in collaboration with the National Physical Laboratory is the determination of the end-products of combustion of nitrogen-containing compounds in the bomb calorimeter. An oxygen-purifying train for the preparation of pure oxygen, and apparatus for analyses of the bomb contents, were on view. Studies of the synthesis of compounds containing labelled carbon have been continued, and some new syntheses, including ring-labelled aromatic compounds, were exhibited. γ-Resorcylic acid has been prepared for clinical tests for the Medical Research Council.

A discovery of great potential importance in connexion with the determination of molecular weights of polymers by osmotic measurements has been made in the High Polymers Section. It has been found that polyvinyl alcohol may be used for preparing improved semi-permeable membranes which possess the advantages of permitting very rapid passage of the common polymer solvents and yet enable rapid and accurate measurements to be made of the number-average molecular weights of polymers of considerably lower degrees of polymerization than heretofore. Furthermore, osmometers of very simple design may be used.

The shortage of sulphur has stimulated inquiry into new sources. The possibility of using micro-organisms for sulphur production from indigenous sulphates is being examined by the Microbiology Section. In June 1950 two members of the Section examined some sulphur-producing lakes near El Agheila in the Cyrenaican desert; they found that the formation of sulphur was due to the combined action of sulphate-reducing and photosynthetic sulphide-oxidizing bacteria. Details of the expedition, illustrated by maps and photographs together with many of the samples actually obtained, were exhibited. Of special interest was a demonstration of the production of sulphur by the symbiotic action of pure cultures of the two types of organisms isolated from the Cyrenaican lakes in a medium containing sulphate as the sole sulphur source.

Included in the Microbiology Section is the National Collection of Industrial Bacteria. Although still in its formative stage, the Collection now maintains more than five hundred strains. Its usefulness is indicated by the increasing world-wide demand for its cultures; last year, more than four hundred strains were supplied to twenty-seven countries. The multifarious activities involved in maintaining cultures were demonstrated, for example, the technique of vacuum freeze-drying; diagnostic bacteriological and biochemical tests used for identification and classification; card index system; package and storage. The use of specific types of bacteria for the assay of antibiotics was illustrated.

# NEWS and VIEWS

## National Science Foundation, Washington: Dr. Paul E. Klopsteg

Prof. Paul E. Klopsteg, professor of applied science and director of research of the Northwestern Institute of Technology, has been appointed assistant director of the National Science Foundation for the Division of Physical, Mathematical and Engineering Sciences. Dr. Klopsteg, formerly president of the Central Scientific Company, has long been associated with the administration of research. During the Second World War he served with the Office of Scientific Research and Development as chief of Division 17, Physics and Special Devices, of the National Defense Research Committee, which developed important equipment and devices for war-time use. Notable among the Division 17 developments were the three 4,000,000-volt X-ray machines built by the University of Illinois under contract with the Office of Scientific Research and Development, and the high-voltage Van de Graaff machine developed under contract with the Massachusetts Institute of Technology for the X-ray inspection of heavy military equipment. Later in the War, Dr. Klopsteg was appointed assistant chief of the Office of Field Service, which organized the supply of scientific consultants to the various theatres of war; in this capacity he was made chief of the Research Division, General Headquarters, Southwest Pacific Area in Australia and New Guinea in 1944. Dr. Klopsteg was awarded the Medal for Merit with Presidential Citation for his war-time work. Continuing his association with Federal research activities since 1945, he has been a member and chairman of the board of governors of the Argonne National Laboratory, operated by the University of Chicago under contract to the U.S. Atomic Energy Commission. Dr. Klopsteg has been director and treasurer of the American Association of Physics Teachers and chairman of the executive committee of the American Institute of Physics. In his leisure he has studied archery, and he is an honorary member and former chairman of the board of governors of the National Archery Association in the United States.

## George Francis FitzGerald Centenary

The Royal Dublin Society will hold a special scientific meeting at 4 p.m. on October 30 to mark the centenary of the birth of George Francis FitzGerald. FitzGerald played a prominent part in many branches of theoretical physics during the last two decades of the nineteenth century, and was the first to show that the generation of electromagnetic waves by oscillating electric circuits was theoretically possible, a prediction verified a few years later by Hertz. He is probably best remembered to-day as one of the authors of the FitzGerald–Lorentz contraction hypothesis, a forerunner of the theory of relativity, which he and Lorentz put forward independently to explain the null result of the Michelson–Morley experiment. The meeting will accordingly be devoted chiefly to the presentation of communications dealing with some modern views on relativity theory. These will include the following papers: Dr. H. E. Ives, "The FitzGerald Contraction"; Prof. W. H. McCrea, "The FitzGerald–Lorentz Contraction—some Paradoxes and their Resolution"; Dr. G. J. Whitrow, "The FitzGerald–Lorentz Contraction Phenomenon and Theories of the Relativity of Galilean Frames"; Prof. J. L. Synge, "Effects of Acceleration in the Michelson–Morley Experiment"; and Prof. F. E. Hackett, "FitzGerald as revealed by his Letters to Heaviside". It is hoped that in addition Dr. E. H. Alton, provost of Trinity College, Dublin, and Prof. H. H. Dixon will contribute personal reminiscences of FitzGerald.

## Training of a Technologist

In his Redwood Lecture "The Training of a Technologist", delivered to the Institute of Petroleum on October 3, Prof. F. H. Garner, professor of chemical engineering in the University of Birmingham, emphasized the importance of the applied scientist possessing, besides his technical knowledge, some understanding of the human mind, personal qualities of leadership and the knowledge of how to handle men, which can be gained only by personal contact and not through books. Prof. Garner did not agree that education should be based solely on the humanities, but he pointed out that the defects of such an education, particularly when it includes no training in science nor any scientific background, is due at least in part to the decay of the religious element and the Christian ideals or philosophy which, until the Edwardian era, had a more marked influence than the classical philosophies. There has been a violent change with our traditions, and it is always desirable that in traditions the rate of change should be slow. This is one of the real reasons why the educated part of the community is proving unfitted to deal with the problems of to-day;