THE CHEMICAL RESEARCH LABORATORY, TEDDINGTON

FOR the fourth year in succession, the Chemical Research Laboratory of the Department of Scientific and Industrial Research held a series of 'open days' during June 27–30. The guests included staff from government departments, universities, industrial firms and the technical Press. In view of the large numbers attending in previous years an extra session was announced, and in this session places were reserved for industrial firms who had not previously received invitations. The response to this announcement indicated clearly that this opportunity to view the work in progress is welcomed by the scientific community.

The research staff of the Laboratory work within six main divisions, namely, the Corrosion of Metals Group, the Inorganic Chemistry Group, the Radiochemistry Group, the Organic Chemistry Group, the High Polymers and Plastics Section and the Microbiology Section. Formerly, microbiological investigations at the Laboratory were concentrated on the study of underground corrosion by the influence of sulphate-reducing bacteria; but, as will be shown later, the scope of the work has been considerably widened, and in January last an independent Microbiology Section was constituted. During the open days the work of these Groups and Sections was set out in great detail; but this note is confined to a brief statement of the nature of the work with special reference to the newer exhibits.

The Corrosion of Metals Group has a large programme concerning the corrosion of metals and its prevention in immersed and atmospheric conditions; in addition, investigations on soil corrosion continue in collaboration with the Microbiology Section. An electron diffraction apparatus has been installed and is being used for the examination of surface films stripped from metals by the iodine – methyl alcohol technique. Marked changes in the mechanism of film formation in the neighbourhood of 200° C. have been indicated in the course of a study of the oxide film on iron. Other films, such as those on nickel, aluminium and phosphated steel, have been removed and examined by the above technique.

Exhibits of special practical interest were those illustrating the use of sodium benzoate in conjunction with a smaller proportion of sodium nitrite as an inhibitor of corrosion, the use of which is particularly advantageous in that both cast iron and soldered surfaces are protected, a result that has hitherto been difficult to obtain when these metals have been present together in the same system. Glycol antifreeze solutions, with and without the inhibiting chemicals, taken from new car radiators after running for some 2,500 miles were in striking contrast; the solution with the inhibitor was water-clear, whereas the other contained much suspended corrosion product. Work in collaboration with the British Rubber Producers' Research Association has revealed that the mixed inhibitor can be incorporated in rubber latex, and metal assemblies protected by rubber films with and without benzoate and nitrite showed clearly the benefit of the new inhibitor. A simplified atmospheric corrosion test has been devised with a view to its adoption by other laboratories; a prototype apparatus was seen in use.

In collaboration with the British Shipbuilding Research Association, a new research has been commenced on the corrosion of boiler tubes with particular reference to Scotch marine boilers; four experimental boilers have been installed.

In previous years the Inorganic Group has displayed specimens of gallium and germanium metals obtained from flue dust, and in view of the interest in these metals samples have been sent on loan to various laboratories for studies of their special properties. The physical properties of gallium are being investigated in collaboration with the National Physical Laboratory, and a newer exhibit showed the remarkable anisotropy of this metal in regard to electrical and thermal conductivity. A new investigation is the treatment of phosphate rock by methods to reduce the consumption of sulphuric acid. A non-hygroscopic product made by the action of a mixture of nitric and sulphuric acids was on view, together with examples of 'complete' fertilizers, that is, containing the three essential plant foods, phosphorus, nitrogen and potassium. Trials of these products as fertilizers are being undertaken, and other methods of converting rock phosphate are being studied. A grating spectrograph is now in operation to supplement the prism spectrographs for the analysis of metallic ores. A well-equipped microanalytical laboratory, which is part of this Group, now provides an analytical service for the Laboratory.

The greater part of the work of the Radiochemistry Group is carried out on behalf of the Division of Atomic Energy of the Ministry of Supply, and is concerned with the analysis and treatment of radioactive ores. Typical methods of treatment were exhibited, together with physical methods of analysis, including colorimetry, polarography and the measurement of fluorescence.

An exhibit of special interest was the further development in chromatographic methods for the separation and estimation of metals and acid radicals by the paper strip and cellulose column. During the year the separation of a number of groups of elements has been studied, including niobium and tantalum and the platinum metals and gold. A new automatic fraction collector has been designed and constructed in the Laboratory; this collects exact volumes of liquid independent of variations in flow-rate, drop-size or specific gravity of the liquid, and without contamination by traces from the preceding sample.

Methods for measurement of radioactivity include apparatus for active carbon (C^{14}), which is now used on a routine basis. The method depends on the counting of active carbon in carbon dioxide gas.

The Organic Group is concerned with the purification of organic compounds and the precise determination of their physical constants, the utilization of tar constituents and the preparation of organic intermediates containing labelled atoms (C^{13}). A precision freezing-point apparatus which has been developed at the Laboratory and uses a pulsating gas pressure to mix the liquid was exhibited.

A new exhibit was a low-temperature still for the preparation of pure hydrocarbons for use in the calibration of mass spectrometers; this was wholly constructed in the Laboratory and is fitted with automatic methods of control. Large-scale glass apparatus is being used on an increasing scale for unit operations, and examples were on view of a continuous solvent still, a reflux unit and a sulphonation apparatus.

An exhibit of considerable interest to organic chemists was a set of molecular models designed and constructed in the Laboratory. They approximate to the Stuart pattern and are machined from cast phenolic resin (see *Nature*, July 8, p. 59).

A newly erected spinning-band fractionating column is being used for the purification of fatty acids.

The main effort of the High Polymers and Plastics Section is being devoted to a study of the ion-exchange properties of high polymers, in particular the effect of polymer structure on ion-exchange equilibria and kinetics. An interesting exhibit was a 'mixed-bed' deionization column. This apparatus, which consists simply of a mixture of a strongly basic resin with a strongly acidic resin in a glass column, provides a very convenient method of preparing water of very low conductivity (specific conductivity $= 0 \cdot 1 \times 10^{-6}$ mhos).

The Microbiology Section exhibited work on the growth requirements of sulphate-reducing bacteria, showing the progressive increase of growth obtained in a series of media ranging from purely inorganic (autotrophic growth) to a very rich organic media. The importance of certain amino-acids for growth was illustrated. Other exhibits showed the quantitative reduction of sulphate to sulphide by these organisms and the competitive inhibition of the reduction by selenates. Work on the functions of sulphate reducers in the underground corrosion of metals was shown, with examples of corroded water and gas mains and suggested methods of prevention. Examples of the photosynthetic green and purple bacteria, which oxidize hydrogen sulphide to elementary sulphur, and of sulphur-oxidizing bacteria, were shown. Included in this Section is the newly formed National Collection of Industrial Bacteria, which maintains more than three hundred strains. Since January 1, 1950, the Collection has sent out some one hundred and fifty cultures in response to requests not only from research laboratories in Great Britain but also from Belgium, Ceylon, Czechoslovakia, Finland, France, Germany, Holland, India, Italy, Poland, Sweden and Trinidad. Methods of preservation, diagnostic tests and classification of bacteria were illustrated.

In addition to the research groups and sections, reference should also be made to the well-equipped workshops, where much of the special experimental plant is designed and constructed. An interesting exhibit on the machines were the jigs used in the preparation of the molecular models.

OBITUARIES

Dr. J. S. Gooden

John Stanley Gooden was born in Adelaide on April 11, 1920. His early education was at the Pultney Grammar School and later Saint Peter's College. He was at the University of Adelaide during 1938–41, where he concentrated on physics and mathematics, graduating in 1941 with first-class honours in physics. He was also proficient in sport, being a valued member of the lacrosse and cricket teams, and a good lightweight boxer.

Early in 1942 he joined the Australian military forces, working on radar problems. In that year he married Miss Claire Ward, daughter of the headmaster of Prince Alfred College, Adelaide. In 1943 he was invalided out of the army after applying for active service, and joined the Radio Physics Laboratories of the Australian Council for Scientific and Industrial Research in Sydney, where he became noted for exceptional experimental ability and his wide knowledge of physics. After the end of the War he worked on the production of one-million volt electrons from cavities excited by pulsed magnetrons, and was the first to attain success in this field.

In December 1945 Gooden arrived in England, and led the team under Prof. M. L. E. Oliphant in the construction of the 1,000 million-volt proton synchrotron in the Nuffield Laboratory at the University of Birmingham. He was responsible on this project for the major part of the general and detailed design and theoretical work, and his ability and energy were an inspiration to all members of the group. It is very sad that he has not lived to see the completion of this large and difficult project after putting into it more than four years of very hard work.

Dr. Gooden made considerable contributions to the theory of particle accelerators, in particular to that region where the motion cannot be regarded as either classical or extremely relativistic. For this work he was awarded the degree of Ph.D. of the University of Birmingham. He also developed the technique of paramagnetic nuclear resonance for the accurate measurement of rapidly rising magnetic fields, as in the proton synchrotron. This led him to investigate this effect under non-adiabatic conditions. During 1947 Dr. Gooden made an extensive tour of many physics laboratories in the United States of America.

Dr. Gooden was a member of the council of the Atomic Scientists' Association. His chief hobby was painting, and his outside interests included the history of art, music and social conditions. The friendship and hospitality of both him and his wife were highly valued by his colleagues.

In early May of this year, Dr. Gooden and his wife and young son flew back to Adelaide, where he fought hard to regain his health; but he died on June 9.

W. I. B. Smith

Dr. J. G. F. Druce

In the early hours of June 22, Gerald Druce died in a London hospital after six months of failing health and much pain. Born in 1894 at Leamington Spa, Druce was educated at Kendrick School and University College, Reading, and at University College, London, taking his M.Sc. in 1921. It was at University College that he first met Héyrovský, through whom he became interested in Czechoslovakia and its people. In 1920 he paid the first of more than thirty visits to that country, and in 1923 was awarded the degree of Doctoris Rerum Naturalium of the Charles University, Prague—a distinction shared by few Englishmen.

During most of his professional life, Druce was chemistry and botany master at Battersea Grammar School, and at the time of his death was head of the Chemistry Department. It was, in fact, in the temporary laboratory in the playground of the School at its original site on St. John's Hill, Clapham Junction, that Druce carried out his early work in search of the missing elements 43, 75 and 93, congeners of manganese, and in 1925 he published, with F. H. Loring, one of the three almost simultaneous papers announcing the discovery of 75 (rhenium). His pupils of those days will well remember the excitement of his isolation of a few colourless crystals of potassium perrhenate from pyrolusite. Yet Druce was an unassuming man; he knew his subject well and knew how to pass on his knowledge to others.