Metallurgy

The Metallurgy (General) Division deals essentially with the treatment, properties and uses of iron and steel. A considerable amount of the work is done extra-murally in university and government laboratories, or collaboratively in the works and laboratories of member firms, but specialist teams in the Divisional Laboratory deal with particular aspects of the work.

Theory suggested that stretcher-strain markings on steel sheet, when deep-drawn or pressed, were produced by the diffusion of nitrogen and carbon through the material. Experiments have confirmed the theory, and have shown that nitrogen has a worse effect than carbon. Transformer laminations are usually made of iron containing 3-4 per cent of silicon. Its magnetic properties are seriously affected by small amounts of impurities, particularly nitrogen. Reducing the nitrogen content of very pure silicon-iron from 0.007 to 0.004 per cent saved rather more than 10 per cent of the total losses, and the effects of additions of nitrogen are much the same in commercial material. The strength, energy and mobility of grain boundaries, which control such properties as brittleness, transformations and recrystallization of metals, are being explored by measurements of internal friction. Work is being done to improve the structure of high-speed tool steels.

Fatigue research was undertaken to determine statistically the variation in fatigue properties of wrought material from different ingots and from different parts of the same ingot for two different casts of steel. Statistically significant variations in properties have been found, but these are not thought to be of practical importance. Further work is in hand with a very-high-tensile steel. Increasing importance is being given to the production, in large quantities, of mild steel having a high resistance to brittle fracture. The effect of variations in rolling conditions, such as variation in the finishing temperatures of rolling, rolling schedules, etc., is being studied.

The analytical section provides a service to the whole Association and also undertakes analytical research. Special methods have often to be developed, for example, for the determination of trace elements, or when only very small samples are available. The characteristics of spectrographic source units and the sensitivity and reproducibility of analysis under various arc-like and spark-line conditions have been studied for a large number of elements normally present in steels.

Steel Users

The Steel Users Section of the Association is mainly responsible for answering technical inquiries on the uses of steel, undertaking *ad hoc* and short-term investigations concerning uses of steel and maintaining contact with the smaller member firms of the Association. Typical work concerns the establishment of the optimum heat-treatment procedure for the manufacture of specific products, investigations of obscure difficulties, and advice on matching the performance of components with steel specifications.

Associated Research Councils

The Cutlery Research Council is an autonomous and independently financed co-operative research organization formed in 1951 to work for members of the Sheffield Cutlery Manufacturers' Association. Its work is organized and controlled by the cutlery industry, but its staff are in close and constant collaboration with the British Iron and Steel Research Association, which provides services, background information on steels, and general assistance. At present the main research projects of the Council are: to improve methods for the production of blanks; to study cutting edges; and to study the grinding and polishing processes used in finishing cutlery. There is also a technical inquiry service, which gives confidential technical assistance to individual manufacturers on application.

The File Research Council is another autonomous and independently financed co-operative research organization formed in 1955 to work for members of either the File Trade Association or the File Manufacturers' Association. The unit is controlled by its member firms, but there is close collaboration with the British Iron and Steel Research Association, which provides services, background information on steel and general assistance. In addition to confidential technical inquiry facilities the Council has begun work on the metallurgy of file steels with particular reference to methods of heat treatment and on testing methods for both saw and engineers' files. The shapes of file teeth and methods of producing a desired shape are also being studied.

The Coil Spring Federation Research Organization has only recently taken over laboratory space at Sheffield; it is in the process of being equipped and expects to undertake active research work in the near future.

OBITUARIES

Prof. Walther Kossel

WALTHER KOSSEL, who died after a long illness on May 22, was one of Germany's outstanding physicists, both as a theorist and as an experimenter. He was born on January 4, 1888, into a family that included many men distinguished for their learning. In particular, his father, Albrecht Kossel, was a famous physiologist, long professor at Heidelberg. A students' torch-light procession in his honour, on the occasion of his being awarded the Nobel Prize in Physiology and Medicine, was one of the events during the time when Walther was working for his doctorate in Lenard's laboratory at Heidelberg.

After taking his doctorate in 1911, Kossel moved to Munich, where the University and Technische Hochschule numbered many names renowned in the physical sciences: men such as Arnold Sommerfeld, Max von Laue and Jonathan Zenneck, as well as the world-famous Röntgen. In this stimulating atmosphere he produced work of prime importance on the electronic structure of the nuclear atom, which was then in active development. In particular he dealt with the theory of X-ray emission and absorption, explaining for the first time the mechanism of excitation of the different series and the fine structure of the absorption edges in terms of the Bohr atom. Equally

important was his work on valency and molecular structure in terms of complete electron groups, work which was fundamental for later developments. Together with Sommerfeld he put forward in 1919 the so-called displacement rule for optical spectra. Thus by the time he was in his early thirties, Kossel was known for basic discoveries in quite different fields of atomic theory. At the same time he learnt with Ze-neck the latest developments of high-frequency electric waves and took part, during the First World War, in the development of electronic valves.

In 1921 he went as professor of theoretical physics to Kiel, which had a fine tradition, Lenard and Dieterici having held chairs there. Here he continued his work on valency and published a second edition of his "Valenzkräfte und Röntgenspektren", the title of which summarizes his work so far. In 1927 he gave evidence of his devotion to a new subject in his first work on crystal growth, in which he dealt with simple structures only, but in a way that lies at the basis of much recent work. In 1932 he followed his old Heidelberg friend Ramsauer by being appointed to a chair at the Technische Hochschule at Danzig, this time as professor of experimental physics, evidence of the range of his activities. Among his most important work here was the discovery of the interference effects produced by the characteristic Röntgen rays excited in a single crystal, in the first case a copper single crystal, the so-called Kossel effect, first announced in 1935. He also carried out distinguished research on the interference of electrons. The significance of his work was recognized by the award of the Max Planck Medal in 1944.

At the end of the War in 1945, Kossel escaped with his family from Danzig, leaving practically all his possessions there, and started again. After a troubled time he was in 1947 appointed professor at Tübingen, the charming town in Württemberg which had escaped undamaged from the war. Here he had an excellent laboratory and a most agreeable residence in the Physics Institute. A great variety of work was here accomplished under his inspiring guidance. Results were produced in the field of the diffraction of electrons and of light, electrical discharges in gases and in the subject of crystal structure, for which he made use of large spherical single crystals of metal, of the kind first produced by his old Heidelberg friend Wilhelm Hausser.

In 1953 his life was saddened by the loss of his beloved wife, who had shared all his troubles with never-failing courage and gaiety and who was always ready for work or play, as occasion demanded. He was already suffering from the illness that ultimately caused his death, so that his last years were in many ways clouded. But he was mentally clear and active until the end, and his plans for future work showed his old powers. He lectured by special invitation in Paris, for example, in 1955.

Kossel was a physicist whose work was throughout marked by clarity and imagination. The fundamental concepts for theory or experiment were simple and original, and they were carried out with remarkable thoroughness and closeness of reasoning. He was an excellent exponent and devised striking lecture experiments. Personally he was a man of great uprightness and warm affection, whose public life and family life were alike admirable. His loss will be widely deplored.

E. N. DA C. ANDRADE

Dr. E. M. Lourie

CHEMOTHERAPY and tropical medicine have suffered loss by the sudden death on August 11 at Geneva of Dr. Emanuel Mannie Lourie, chief of the Section of Biological Standardization of the World Health Organization. He was born in Johannesburg on February 18, 1904, and studied medicine at University College Hospital, London, qualifying M.B., B.S. in 1928. He took the D.T.M. & H. of the London School of Hygiene and Tropical Medicine in 1930 and the D.P.H. in 1934; and he was elected M.R.C.P. in 1948. After qualifying he worked for various periods in Palestine, at the Liverpool School of Tropical Medicine and at Chicago with Prof. W. H. Taliaferro. In 1934 he returned to the Liverpool School as a Beit Memorial Fellow to work in close association with Prof. Warrington Yorke on the chemotherapy of trypanosomiasis. After the death of Yorke in 1943 Lourie was appointed as the first director of the Department of Chemotherapy of the Liverpool School of Tropical Medicine. During his whole association with the School he was one of its chief scientific ornaments, and in 1945 he was awarded the Chalmers Gold Medal of the Royal Society of Tropical Medicine and Hygiene. In 1948 he left the Liverpool School and after a short period in the Department of Pharmacology at Oxford he joined the World Health Organization, in which his work and his personality were highly appreciated.

Lourie's scientific work covered a wide field; but his main contributions were made in the chemotherapy of tropical infections. In the four years before the Second World War, he and Warrington Yorke discovered the diamidine compounds as a cure for trypanosomiasis and other infections. One of these compounds, pentamidine, was later found to have a prolonged prophylactic action, so that a single intramuscular injection is sufficient to protect against trypanosomiasis for more than six months. This compound has been used prophylactically on a wide scale in Africa and has made a large contribution to the conquest of human sleeping sickness there. Lourie took a major part in developing these compounds, both in Britain and in Africa. In 1943 he discovered that the new antibacterial agent, penicillin, was also very effective in curing mice infected with *Spirochaeta recurrentis*, the organism of relapsing fever. This finding obviously suggested that penicillin would probably be effective also against the organism causing syphilis, and Lourie in collaboration with others showed that this was in fact the case. His important discovery was, however, overshadowed by the simultaneous publications of American workers, and so it did not receive the recognition which was its due.

After the War Lourie showed that the newly discovered antimalarial compound proguanil ('Paludrine') would induce drug-resistance in the malaria parasite of chickens, *P. gallinaceum*. He also studied the melaminyl series of arsenical compounds and promoted the further investigation of these compounds in the field in Africa.

One of Lourie's later contributions to knowledge has only recently been properly appreciated. In 1950 he showed that the acidic compound, suramin, formed complexes with the basic compound pentamidine, such that the toxic action of the two was diminished but the prophylactic action against trypanosomes was greatly prolonged. Recently