

in the same temperature-range. The results showed that the behaviour of some metals, notably of tungsten and molybdenum, which formerly had been considered anomalous because of a large relative increase in resistivity, can be explained if the high recrystallization temperatures of these metals are taken into account. Another observation was that, on wire-drawing and rolling, the electrical resistivity of some cubic metals becomes anisotropic. An analysis of the results indicated that the increase in electrical resistivity with deformation may not be caused entirely by dislocations and lattice vacancies, but that stacking faults in face-centred cubic crystals may also play an important part.

Mechanism of Phase Changes

There are two ways in which a transformation in the solid state may occur. First, the atoms may be rearranged to form a crystal of the new structure which has the same external shape as the original crystal. Such transformations involve nucleation and growth of nuclei, and depend on thermally activated diffusion. Secondly, the rearrangement of the atoms may occur in such a way that each atom has the same neighbours in the new structure as it had in the old. This leads to a change in external shape which produces relief effects on polished surfaces. These phase changes occur extremely rapidly, even at temperatures where the rate of diffusion is very small, and proceed only during cooling and not isothermally to any appreciable extent.

As for the mechanism of thermally activated diffusion, it appears that the movement of atoms is connected with that of lattice holes. The development of the theory may be assisted by investigating the effect of atomic packing on the rate of diffusion, and for this reason the rate of self-diffusion was measured in various directions in tin crystals; as these show anisotropy of the diffusion-rate and no chemical complications occur, since only one type of atom is involved. It was found that the activation energy for diffusion along the tetragonal axis was about one and a half times that for diffusion in any direction at right angles to it, and the geometrical factor was about forty times larger for the tetragonal axis. However, it has not been possible to correlate the activation energy with such other physical properties as are mainly determined by the energy with which the atom is bound to its equilibrium position in the structure.

The investigation of 'diffusionless' transformations is particularly attractive, as it is hoped that from their features the movement of the atoms during the transformation may be deduced. An attempt is now being made to determine the atomic movements in transformations which produce changes in external shape, although they occur by thermal diffusion. The fact that the orientation of the new crystals is related to that of the matrix suggests that the mechanisms by which nucleation-growth and diffusionless transformations occur may not be as fundamentally different as was previously thought.

The work described in this paper is the result of close collaboration of a number of workers, and it is difficult to disentangle the individual contributions. For this reason no reference has been made to particular publications.

OBITUARIES

Dr. R. W. Gurney

DR. RONALD GURNEY, who died at his home in New York on April 15 at the age of fifty-four, was born in Cheltenham and was educated at Cheltenham College. After service in the Gloucestershire Regiment in the First World War, he went to Cambridge, where he was an undergraduate at Trinity Hall. He began his career as a scientist at the Cavendish Laboratory under Rutherford, where he carried out experiments on the ionization by fast particles and published a number of papers on this subject. It was during a visit to the United States, however, that he made in 1929 the first of those striking incursions into theoretical physics by which he will be mainly remembered; in collaboration with E. U. Condon, he gave the first correct explanation of α -decay in terms of wave mechanics, anticipating by several months the similar but more detailed treatment of Gamow. From this time onwards he became a theorist; after some years at Manchester with W. L. Bragg, he came to Bristol in 1935 and worked with me. We produced jointly the book "Electronic Processes in Ionic Crystals", and also a theory of the nature of the photographic latent image, much—if not all—of which has stood the test of time. In addition, he worked on the theory of liquids, and in Manchester and Bristol he laid the foundation of his future work on ions in solution.

In 1941 Gurney went to the United States and worked first at the Ballistic Research Laboratories of the Aberdeen Proving Ground, then at the Argonne Atomic Laboratory, at the Johns Hopkins University, and finally at the University of Maryland.

Gurney's publications include the books "Elementary Quantum Mechanics" (1934), "Ions in Solution" (1936), "Introduction to Statistical Mechanics" (1949) and "Ionic Processes in Solution", recently published by the McGraw-Hill Book Co. It was typical of him that, though he could use mathematics as well as another, he never trusted it; no theory was a theory to him until he could grasp it intuitively and, above all, draw diagrams of it. In this he was among theorists perhaps the truest representative of Rutherford's school, and of the British tradition. Wherever Gurney went—and not least at Bristol—he contributed to the work of the place a capacity to see things clearly, graphically, and in their essentials. He was a man with whom it was a privilege to work, and from whose unique qualities of mind and character his collaborators could learn much.

In 1950 Gurney had a stroke, and although he recovered well he was advised not to incur the strain of regular lecturing. During his last three years he was able, with the constant help of his wife Mrs. Natalie Gurney, to devote himself to his last book, which has appeared since his death. His many friends and colleagues will look forward to another example of his unique ability to make the complex simple and to get to the heart of things.

N. F. MOTT

Dr. C. E. M. Joad

DR. C. E. M. JOAD was reader in philosophy in the University of London and head of the Department of Philosophy, Birkbeck College. By his recent death, philosophy has lost one of its most lucid expositors and teachers. A list of his writings shows how wide were his interests. He was not satisfied until he had

studied the philosophical bearings of modern developments in science, in the theory and practice of politics and in changes in manners and morals. When his thinking led to a major change in his personal beliefs, he explained his reasons and his readers had the full benefit of his experience. He thought aloud and on paper, and he dealt with no problem which he did not illuminate. His favourite saying was that if anything could be said, it could be said clearly, and certainly he never said or wrote anything vague or obscure. This may sometimes have led him to oversimplify some problems and to do less than justice to the more subtle points, but his readers have nothing to unlearn; they are beguiled into a deeper study of the problems set out in such a clear and stimulating way in Dr. Joad's various guides to philosophy. These books are models of what an introduction to a difficult subject should be.

In his own philosophical thinking, Dr. Joad was in the unfortunate position of having outgrown the Idealistic teaching of his Oxford days, and of being out of sympathy with the modern school, though he never ceased to admire the brilliance of its leading thinkers. He thought he had found the key to much that is unsatisfactory in modern thinking and conduct in the 'dropping of the object' in our judgments of value, a view that is presented brilliantly and provocatively in his study of decadence. He was happiest in the writings of the ancients, and he had the faculty of presenting their problems as though they were fresh and contemporary. To hear him lecture on the Nicomachean ethics of Aristotle was an unforgettable experience.

Dr. Joad esteemed it a privilege, and the source of his greatest satisfaction, to have been able to guide the thinking of so many young people. Thousands of students, inside and outside university walls, owe to him the discovery that it is exciting to think and a duty to think clearly. He will be missed far more than he would have expected, for he was essentially a humble man.

Mr. W. Birtwistle

MR. W. BIRTWISTLE died at Skibbereen, Co. Cork, on March 4, within two days of his sixty-third birthday. Educated at Blackburn Grammar School, he served in the First World War, and in 1920-24 studied oceanography and fisheries under the late Prof. James Johnstone in the University of Liverpool. In 1925 he took up duty as fisheries economist, in charge of the Fisheries Department, Straits Settlements, and Federated Malay States, later assuming the title of director of fisheries. He retired in 1945.

Mr. Birtwistle was a pioneer of fishery development in the Far East, with especial attention to the introduction of power-driven fishing craft, and the cultivation of fish in rice fields. These and many other developments he sponsored were published in the annual reports of the Malayan Fisheries Department. He could foresee future developments in Asia, and made provision for the advanced training of Asian staff in the late 1930's. The wisdom of this has already been shown in the good work done by these men. He was highly respected by the fishermen, and on his death tributes were paid by men of all nationalities in Malaya.

NEWS and VIEWS

Sedleian Chair of Natural Philosophy at Oxford : Prof. Sydney Chapman, F.R.S.

THE retirement of Prof. Sydney Chapman from the Sedleian chair of natural philosophy at Oxford has just been announced. Prof. Chapman reaches the age limit after occupying this chair since 1946. Before going to Oxford (see *Nature*, 157, 155; 1946) Prof. Chapman had been at the Imperial College of Science and Technology, London, for no less than twenty-two years. Fortunately, his departure from Oxford is not going to hinder his interests in geomagnetism and the upper atmosphere, for he is to continue as professor of geophysics at the University of Alaska, an appointment which he has held since 1951 in addition to his work at Oxford. His many friends all over the world will be glad to think that in this way he will be able to increase the very considerable debt that is already owed to him by workers in those fields which are peculiarly his own, and where his influence will remain for many years to come.

Prof. George Temple, F.R.S.

THE appointment has been announced of Prof. George Temple to succeed Prof. Chapman. Like his predecessor, Prof. Temple has wide interests. Educated at Birkbeck College, London, and Trinity College, Cambridge, he held teaching posts at Birkbeck College (1922-24), at the City and Guilds College (1924-28) and at the Royal College of Science (1928-30) before being appointed to the chair of applied mathematics at King's College, London, a position

which he has held with great success for the past twenty-one years. Prof. Temple was elected a Fellow of the Royal Society in 1943. His earlier researches were in mathematical physics and relativity, to be followed by a vigorous and highly productive application to the quantum theory when this was developed in the late 1920's. A text-book on Rayleigh's principle and another on the general principles of the quantum theory bear evidence of these interests. More recently he has been occupied with problems in aerodynamics, and has become one of the leading theoretical experts in the subject in Britain. He will be most welcome at Oxford, where his wide knowledge of mathematics will help to supplement that of his colleagues, and where his considerable administrative experience and easy charm of manner will prove most valuable.

Letters to Sir William Siemens

A COLLECTION of more than two hundred and fifty letters written by men of science, statesmen, artists and other notable personalities to Sir William Siemens, the distinguished scientist and engineer of the nineteenth century, has recently been acquired from a relative of Lady Siemens by Sir George Nelson, chairman and managing director of the English Electric Co., Ltd. These letters, arranged chronologically, have been mounted in two special volumes with the printed text on facing pages, together with a short biography of Siemens written by W. H. Kennett, short notes on the authors of the letters and an index. A third volume, made up of the printed copies of the letters, the biography, etc.,