properties (especially for Be). Numerous historical values for a few properties are listed together with a preferred value. Data on ionic size and ionization potential are lacking. The average abundance of the elements in the Earth's core is given but, except for Tl and Ge, practical availability is not mentioned.

Non-tabular matter includes physical and technological properties, chemical properties and stability, and areas of use of the metal alloys and other compounds. Although this occupies such a small portion of the book it is both disproportionately useful and topical. For example, Rb is shown to be valuable in the semi-conductor industry, the telluride has the maximum known sensitivity to light in the far ultraviolet (more so than Cs_2Te), a mixture of metal and oxide has a very low electronic work function, its salts are catalytic in methanol synthesis from steam and other compounds are used as pain killers and soporific agents. The authors state that "development of the production of Rb and its salts in sufficient quantity at reasonable prices will expand its use in modern technology" yet production figures are only given for Rb, Se and Tl and there are no data on production costs or metal prices for any of the elements. References (not all different) are given, but there is little uniformity in citation. Initials of authors appear to be optional and several references mention neither author(s) nor editor(s).

J. R. BUTLER

Obituaries

Professor George Gamow

GEORGE GAMOW, who died on August 20, was for the last twelve years of his life professor of physics at the University of Colorado. Born in Odessa, Russia, in 1904, he was educated at the University of Leningrad, where he received his PhD in 1929. He worked for various periods at Göttingen, Cambridge and Copenhagen, and returned to Leningrad in 1931. He left Russia in 1933, and after a year in Paris and London went to the United States. He held a professorship at George Washington University, Washington, DC, from 1934 to 1956, when he moved to the University of Colorado.

The major part of his work up to about 1936 was devoted to nuclear physics. In his earliest work he formulated the theory of alpha decay in terms of the transparency of potential barriers. This theory, which was independently developed by Condon and Gurney, was an outstanding success. He proposed the liquid drop model of the nucleus. Later, in collaboration with Atkinson and Houtermans, he studied the calculation of thermonuclear reaction rates. The basic formulae which he obtained are central in calculations of thermonuclear energy production. He continued his work in nuclear physics after his move to the United States, and in collaboration with Teller he improved the theory of beta-decay by formulating the Gamow–Teller selection rule.

Gamow had been interested in astronomy since his thirteenth birthday, when his father gave him a small telescope. Following his work on nuclear reactions he turned to astrophysical problems and worked on the theory of the internal structure of red giant stars. He stressed the possible role of neutrinos in stellar evolution, and with Schönberg developed the URCA process, in which a nucleus captures an electron, with the emission of a neutrino, and the resulting nucleus decays into the original nucleus with the emission of an antineutrino. This work drew attention to the emission of neutrinos as a possible energy loss mechanism. Gamow was a staunch proponent of the "big bang" cosmological theory of the universe, and made contributions to the theory of the origin of the elements. He showed that in the early stages of the expansion of the universe the mass density of radiation would have been much larger than that of matter, and that by the present time it would have been diluted to a temperature of 7° K. This prediction has been brilliantly confirmed by the discovery of 3° K radiation in the universe. From about 1954 Gamow became interested in biological phenomena, and published papers on the information storage and transfer in a living cell. He pioneered in work on DNA which contributed significantly to the breaking of the genetic code.

Throughout his career he was deeply interested in the popularization of science, and he had a unique ability in writing for the general public. He published almost thirty books, seven (including two in the press) technical and the rest popular, more than a hundred technical papers and some thirty popular articles. His outstanding contributions to popular science writing were recognized by the award by the United Nations in 1956 of the Kalinga prize. He was a member of many academies, including the Danish, United States and Soviet academies (his membership in the latter was cancelled when he left Russia). In 1965 he was elected an Overseas Fellow of Churchill College, Cambridge.

Dr R. C. Valentine

ROBIN CYRIL VALENTINE died peacefully in University College Hospital on October 10 after a short illness. He was 40 and on the threshold of a distinguished career in biological and medical research. An undergraduate in physics at the University of Cambridge, he worked for his doctorate at the Cavendish Laboratory during 1951–54 on the electron microscopy of bacteria. During this time he reached a firm conviction to devote himself to medical research and began a programme of self-education in microbiology which he was to complete so successfully. In 1954 he was appointed to the Biophysics Division at the National Institute for Medical Research and continued there in a senior appointment until the time of his death.

He quickly realized the potentialities of high resolution electron microscopy in molecular biology, while acutely conscious of the frustrating limitations imposed by available methods of specimen preparation, and by the fragility of the specimens. He skilfully exploited the phosphotungstic acid negative stain technique introduced in 1959 by Brenner and Horne, producing superb micrographs with little or no technical assistance, and acquiring a flair for imaginative, but firmly based, interpretations. Valentine was fascinated especially by the symmetrical arrangements of structural subunits that he saw, first in viruses and more recently in some protein macromolecules and crystals. He collaborated with the late Alick Isaacs, among others, in research on influenza and other respiratory viruses. A high point was reached in 1965 in a detailed investigation with H. G. Pereira into the morphology and antigenic composition of adenovirus type 5; it was shown, *inter alia*, that the twelve structural subunits (or capsomers) located at the vertices of the icosahedral virion are distinctive in terms both of antigenicity and morphology, and are characterized by spectacular "antenna-like" projections.

Valentine now turned his attention to the challenging problems of protein structure, and soon had at his disposal a variety of valuable specimens, uniquely suited to the negative contrast technique, and originating from biophysical and biochemical laboratories in North America and many European centres as well as Britain. The following enzymes, most of which were crystallized only in recent years, were examined and photographed by him with the electron microscope: catalase, fructose diphosphate aldolase, pyruvate carboxylase and transcarboxylase, muscle phosphorylase, glutamine synthetase and glutamate dehydrogenase. Valentine's micrographs were among the most beautiful and informative of their kind, and demonstrated the crucial importance of double bonded