

CHEMISTRY OF THE ATMOSPHERE

Air Chemistry and Radioactivity

By Christian E. Junge. (International Geophysics Series, Vol. 4.) Pp. xii+382. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1963.) 96s. 6d.

AIR chemistry, as defined by Dr. Junge, is concerned with the constituents and chemical processes of the atmosphere below about 50 km. His unique book, *Air Chemistry and Radioactivity*, presents a comprehensive account of this new branch of atmospheric science and emphasizes the variations in space and time of gaseous, particulate and radioactive substances, and their circulation within the troposphere, stratosphere and lower mesosphere. It does not deal with the photochemical and corpuscular processes that dominate at levels above 50 km.

Atmospheric chemistry began about a century ago with investigations of trace substances in rain-water and concentrated for many years on the radioactive emanations and on ozone. In recent years the subject has received a great deal of stimulation from the rapid development of cloud physics, which is much concerned with the nature and origin of particles that act as condensation and freezing nuclei, and also by the large-scale injection of radioactive isotopes into the atmosphere from nuclear and atomic explosions. Much of the leadership and enthusiasm from the meteorological side was provided by the late Prof. C. G. Rossby, who encouraged the widespread sampling and chemical analysis of air and precipitation in the belief that the chemical constituents would provide convenient tracers for the investigation of air motion and the general circulation of the atmosphere. Much of the pioneer work was carried out by Dr. Junge, and we must now be grateful to him for placing the subject in good order before us.

There are five main chapters. The first discusses the variable gaseous constituents of the atmosphere—their origin, distribution, transport, circulation, sources and sinks, and the various chemical reactions in which they are involved. A great deal of observational data is well summarized in graphs and tables, is critically discussed and realistically assessed.

The chapter on aerosols contains good descriptions of the concentration, size distribution, composition, nature and origin of air-borne particles, and discusses their role as condensation nuclei in clouds. The sections on optical and electrical properties of aerosols and on stratospheric aerosols are particularly valuable, because the information is not available in convenient form elsewhere. The text is repetitive in places and would have benefited from some rearrangement of material and a tightening of the general line.

The third chapter, of 80 pages, is devoted to atmospheric radioactivity and summarizes present knowledge concerning radon, thoron and their decay products, the radioisotopes produced by cosmic rays, and artificial radioactivity produced from atomic and nuclear weapons. This last-mentioned section, which contains coherent accounts of the production and distribution of fission products in the troposphere and the stratosphere, and of radioactive fall-out, brings together much valuable information that was rather widely scattered and inaccessible.

Chapter 4 reviews the various mechanisms by which gases and aerosols are removed from the atmosphere and summarizes the extensive measurements of the chemical composition of rain-water at many stations in the United States and Scandinavia. Dr. Junge produces maps showing the geographical distribution of the various chemical elements which throw some light on their sources and sinks, and their transport and transformation in the atmosphere. But this aspect of the subject has scarcely

emerged from its geographical stage and the outcome of so much effort is, perhaps, disappointing. A final, short chapter discusses the role of air pollution in air chemistry and describes the typical constituents of an industrially polluted atmosphere.

This is an important, if rather highly specialized, work that will serve as a valuable book of reference for all who are interested in the constitution of the troposphere. There are extensive bibliographies at the end of each chapter, a good author index but a rather inadequate subject index. Dr. Junge writes well in his adopted language, but could have been served much better by his proof readers; there are many misprints though few of scientific consequence.

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ORGANIC MATTER IN ROCKS

Organic Geochemistry

Edited by Prof. Irving A. Breger. (International Series of Monographs on Earth Sciences, Vol. 16.) Pp. x+658. (London and New York: Pergamon Press, 1964.) 140s. net.

IN some quarters there is the impression that a publication is seriously at fault if it does not contain the most recent ideas and data. This narrow outlook puts a book in the same category as yesterday's newspaper, rapidly heading for the waste-paper basket; it fails to recognize that fresh workers are continually joining all branches of human activity, and what is already well known to the experts is new to them. Moreover, occasionally workers, although they are busy with the latest techniques, lack knowledge of published relevant work done in the same field many years ago. Naturally, authors like to be up to date, but newness is of necessity transitory. For several reasons, therefore, the footnote dates of submission at the beginning of many of the chapters in *Organic Geochemistry* need be of little concern.

Organic geochemistry, comparatively new as a name, is by no means an entirely new field of scientific endeavour. It is an outgrowth of earlier work on coal, petroleum, soils and oil shales; in recent years links have been forged with such problems as the origin of life and organic matter in meteorites, leading to controversies, and calling forth ingenuity, experimental and otherwise.

Rapid advances in organic geochemistry have taken place during the past ten years. The subject has its own special problems, and, as the name implies, depends heavily on techniques and assemblages of data developed in chemistry in particular, a field in which growth has been even greater. The authors of the various chapters in *Organic Geochemistry* have, in general, recognized this dependence clearly, and have consequently provided leads to the appropriate fundamental literature. The extensive bibliographies give a good spread of publications in time, and references to publications in languages other than English are by no means rare. With minor exceptions, unnecessary repetition and irrelevant excursions have been avoided.

Humus, kerogen, coal, petroleum, and native bitumens associated with oil shales, each has a chapter, and the same is true for the organic pigments, amino-acids, carbohydrates and lipids, the emphasis being particularly on their occurrence in rocks and soils; and sulphur, silica and marine carbonates are considered from the point of view of the organic geochemistry of the formation of deposits. Other chapters deal with the origin and classification of naturally occurring carbonaceous substances, organic cosmochemistry, and pre-biological formation of biochemical substances. American workers have been especially active in the realm of organic geochemistry in the post-war years. Hence, it is not surprising that almost all the contributors to the book are from the United States.