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Book Reviews

Chemistry of Nuclear Power. By J.K. Dawson and G. Long. Philosophical Library, Inc., New York, (1959). VIII + 208 pp. $10.00.

As is well known, mechanical and electrical problems can usually be solved, but chemical problems present a much higher order of difficulty. Nuclear energy presents chemical problems of exceptional difficulty because of the effects of intense neutron and lepton radiations on everything. It is fortunate, therefore, that two chemists at Harwell (England) have come forth with a small but excellent book dealing with the chemical side of nuclear energy enterprises.

The 1946 Atomic Energy Act (McMahon) contained ill-advised provisions that prevented collaboration on nuclear energy matters with any nation. The provisions applied to Britain and Canada, in spite of the fact that scientists from both countries played important roles in the wartime Manhattan Project and even encouraged research on nuclear fission along military lines before our own country had come to a decision on the matter. Undaunted by the restrictions, the British scientists, upon their return home after the war and armed only with their backgrounds and memories, took the difficult steps that led to a full scale nuclear energy industry now providing military needs and considerable electrical power in the United Kingdom. With the full cooperation of industry and government they assembled materials, built and used research laboratories and pilot reactors, and then erected plutonium and diffusion factories. As a culmination of their efforts, they exploded a nuclear bomb in 1952 and in 1956 started up a large nuclear power plant at Calder-Hall. (There are now some nine such plants in Britain; cf. John Maddox, *Manchester Guardian Weekly*, January 9, 1964.)

The book under review presents fine examples of an ability characteristic of chemists, who are of course indisputably brighter than physicists, to deal successfully with problems involving many variables. In a delightfully clear way the authors discuss the various chemical problems that arose in the development of nuclear power and the solutions found for them. They describe how very pure uranium compounds and the metal itself are cooked out of uranium ores, how materials were arrived at which would safely contain the nuclear fuel elements and still survive intense radiations, how pure plutonium and the fission products can be separated from spent fuel elements, how to dispose of radioactive waste materials, what the effects of radiations are on reactor materials, and what are the hazards to personnel. The authors also talk about money and costs without any false diffidence. Suggestions are considered in the eleventh and last chapter for chemical manufacturing applications of nuclear radiations. Each chapter ends with a few key references.

In short, the authors present a wealth of material with just enough detail to make it plainly understood; one finds no double talk nor signs of vagueness anywhere in the book. Professional nuclear scientists should find the book refreshing; students will find it inspiring; the humanists probably won't understand its high significance; and poets should see in it transcendent themes to challenge their powers. To laymen, the book's fruitful pages may well clear up popular misconceptions about the "atom"; used industrially it is not a bomb in disguise.

Splendidly written and highly important, still the book is not modeled directly after Homer or Pindar. Although a few investigators are named, the main accent is on chemistry and materials, but with an undercurrent that tells of heroic efforts and great accomplishments. To be sure, no nut-brown maidens were rescued from the pit, nor were undraped lovelies chased around idyllic lakes or office desks; and neither bad guys nor good guys gunned each other down in wild shoot-em-ups. But a handful of chemists did preserve the dignity and admirable stature of a great nation; the course of history was turned, and for the better.

Nuclear energy was born and, like modern war, has reached adolescence as a public enterprise. Since the Western World is rightly partial to private enterprise, it is not surprising that nuclear energy has been subjected to both direct and oblique opposition, often on trivial grounds. In fact, as a result of phillipics against almost everything from fall-out and cranberries to our affection for grog and lady nicotine, we appear to

be faced with formidable hazards on every side. The authors of *Chemistry of Nuclear Power* are plain spoken about the dangers of nuclear radiations, but they are also clear about how to avoid them. This gives the present reviewers renewed confidence that mankind can now go boldly forward, again unafraid and unashamed of life and love and happiness.

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About the Reviewers: Don M. Yost, Professor of Chemistry at the California Institute of Technology, writes of his co-author in this review, "Mr. Gomez is a capitalist who is closely familiar with and highly skilled in technical matters, especially those involving metals and internal combustion engines. He was born in Montana of a British mother and Swedish father, but he has lived in Idaho since he was a small fry." He also acknowledges help from Mrs. Margaret Sullivan Guthrie, who he claims, (more believably), is Irish.

The Atomic Energy Deskbook. By John F. Hogerton. Reinhold Publishing Corporation. 673 pp. $11.00.

For a work covering such a broad range of subject matter, *The Atomic Energy Deskbook* does a remarkably good job of distilling out the significant essence of the many topics discussed. This reviewer must confess to a certain amount of preconceived skepticism that the *Deskbook* would be likely to be of much interest to anyone except the novice or industrial executive trying to get oriented in the field. A quick scan of the "A" column at the beginning of the table of contents did little to alleviate this feeling, since Access Permits, Accountability, Agreements for Cooperation, etc. are not very inspiring subjects to most of us.

However, the more one delves into the actual material in the book, the more evident it becomes that John Hogerton and his associates have succeeded to a high degree in meeting the stated objectives of the Atomic Energy Commission in sponsoring the preparation and publication of the material, and that the book will be found both interesting and useful to the specialist in atomic energy as well as the layman and industrial executive. Everyone doing serious work in any phase of atomic energy feels the need for a source of concise authoritative information on the very many subjects in areas lying outside his immediate knowledge. *The Atomic Energy Deskbook* supplies this need better than any other single volume known to the reviewer.

It is possible to find some flaws in the information given at various places in the book, although they are few in number and are far overshadowed by the excellent discussions given on practically every topic covered. Some flaws noted in spot reading by the reviewer: the Turkish Nuclear Research Center built around that country's first reactor is located at Istanbul rather than Ankara; in the discussion of fission product isotopes and their applications, no mention is made of the major role played by Hanford in large scale recovery operations on several of these isotopes; the prime example of the use of dispersion-type fuel elements (the Peach Bottom Reactor) seems to have been overlooked in the discussion of this fuel type; and Chadwick did more than "postulate the existence" of the neutron in 1932, - his experiments played a predominate role in its discovery.

The two longest discussions in the book are those on Nuclear Power Development (9 pages) and Nuclear Power Economics (24 pages). The latter is so extensive and thorough as to constitute almost a classic treatment of the subject, if such a term can be applied to such an elusive thing as nuclear fuel economics. Despite the primary dedication of the book to the industrial segment, the length of treatment accorded the latter subject seems to the reviewer to be somewhat out of proportion to the relatively brief treatment necessarily given to many other important topics.

The organization of the subject matter in *The Atomic Energy Deskbook* is such as to make it easy to find whatever one is looking for by following the alphabetical sequence and simple suggestions given in the author's preface. The format, photographs, type size, printing and paper quality are all excellent. Here is a book that should be on the desk of everyone, technical or non-technical, who feels a need to have a good source of information in brief form on all phases of atomic energy.

Richard L. Doan

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About the Reviewer: Richard L. Doan hardly needs an introduction to this readership. He was the first director of the Metallurgical Laboratory at Chicago (now Argonne National Laboratory) and the first research director of Clinton Laboratory (now Oak Ridge National Laboratory) and for the past twelve years, until August 31, 1963, manager of the Atomic Energy Division of Phillips Petroleum Company. He was a member of the Board of Directors of the American Nuclear Society from 1955 to 1959.