There are other themes worthy of consideration running through the book. The most significant among these which apply to the relation between technological change and cultural change can be found in his concluding chapter. I find well-placed his stress upon the man-created environment as a complex of factors having tremendous effect upon man and his history. His call for us somehow to exercise more control over this environment which, though man-made, has a mass and a movement that seem to defy control, is also provocative and convincing.

Thomas P. Hughes is a visiting professor in the Johns Hopkins History Department teaching the History of Technology. A member also of the Center for the Study of Recent American History, he is writing a biography of engineer-inventor Elmer Sperry of gyroscope fame. The works he has edited include Lives of the Engineers *and* The Development of Western Technology.

RUNNING ON A TREADMILL

Title Semiconductor Counters for Nuclear Radiations, 2nd ed.

Authors G. Dearnaley and D. C. Northrop

Publisher John Wiley & Sons, Inc., 1966

Pages xx + 459

Price $12.75

Reviewer Brian D. Pate

This is the second edition of a book which, even though it suffers from the disadvantage of dealing with a fast-moving field, continues to be a useful reference text. It now contains descriptions of experimental procedures sufficiently detailed to permit the occupant of a reasonably well-supplied laboratory to fabricate his own semiconductor detectors of good quality, improve their longevity, and apply them to a variety of problems.

In addition, the treatment of device physics, particularly of charge collection and noise in semiconductor detectors, is of such lucidity that the average experimentalist can learn much of the quixotic physics and chemistry that lie behind this entire field.

The main differences between the first and second editions of this book reflect the advances that occurred in this field between May 1963 and September 1965. First and foremost was the rapid advance in the techniques of lithium drifting and the successful application of large-volume lithium-drifted silicon and germanium detectors to high-energy charged-particle spectroscopy and gamma-ray spectroscopy, respectively. This success has led to relatively less attention being paid to homogeneous conduction counters and gamma detectors fabricated from higher *Z* semiconductors, a change in emphasis reflected in this book.

Other advances reported are the discovery of "channeling" in the interactions of charged particles with crystals and the development of more sophisticated instrumentation for use with semiconductor detectors.

In short, this is a book that has a place in the book shelf of every experimentalist interested in making or using semiconductor detectors. This writer's main criticism of the second edition is, however, that it was, in a sense, published too soon. Since September 1965, there has been a continuous stream of publications (in the IEEE *Transactions on Nuclear Science, Nuclear Instruments and Methods,* and AECL Chalk River Reports, to mention only three media) that have reported the fundamental discoveries and rapid progress that has been made (particularly in the field of lithium drifting) in the last 18 months.

Hindsight is, however, always 20-20 and perhaps the authors were right in not delaying the publication of the second edition. It is entirely possible that, had this book been written in 1967, a reviewer might, in 1969, still be regretting the failure to include the latest and most exciting developments.

Brian D. Pate is Professor and Head of the Chemistry Department at Simon Fraser University, Burnaby, British Columbia, Canada. He accepted this position in 1964 after working in nuclear chemistry and nuclear spectroscopy in the AERE in Great Britain, McGill University in Canada, and at Brookhaven National Laboratory and Washington University (St. Louis) in the US. His PhD (Chemistry, 1955) is from McGill University.

SPREAD THE BURNING SAND

Title Water Production Using Nuclear Energy

Editors Roy G. Post and Robert L. Seale

Publisher University of Arizona Press, 1966

Pages 392

Price $7.50

Reviewer Lionel S. Galstaun

This volume comprises a collection of papers presented at a symposium held in March 1966 under sponsorship of the Nuclear Engineering Department of the University of Arizona. The topic of the symposium, the use of nuclear energy in desalting water, has been approached on a very broad basis; papers were presented on the future needs of water; the sociological, economic, and legal aspects which might confront large-scale desalting facilities; and directions of future advances in both nuclear and desalting technology. In addition, one paper describes the NAWAPA concept which would develop new sources of water and power for the greater part of the North American continent from streams in Alaska and Canada.

The greater portion of the book is concerned with descriptions of the state-of-the-art as of March 1966 in nuclear heat sources and desalination. Primary emphasis has been on large plants producing water at minimum cost. The reader is left with the impression that the results described are likely to be close to the ultimate that can be achieved using present technology, scaled up in size. This is likely to be the chief value of the book as a point of reference.

A substantial portion of the book is concerned with the probable direction of future advances, both in nuclear and desalting technology. In the nuclear field, papers are included on the water-cooled, graphite-moderated reactor, the organic-cooled, heavy-water-moderated reactor, the fast breeder, and the helium-cooled, graphite-moderated reactors. With regard to the last three, which share a common characteristic in typically producing high temperature and high pressure steam, unfortunately no consideration is given to the higher power-to-water production ratio inherent in such systems when used in dual-purpose (water and power) plants. This fact could be crucial in the selection of heat sources in dual-purpose applications in many parts of the world.

In the desalting field, advanced concepts are outlined in the paper by Hammond. The principal thesis is that improvements may be coming in the performance of heat exchangers in distillation plants by improved methods of scale control. There is no question that present methods represent a substantial expense and should be capable of improvement. This is an active field of research, and many concepts are receiving attention.

The book contains its share of typographical errors. These are both obvious and relatively infrequent. More serious are some errors in concept or understanding. For example, on page 64 (fourth complete paragraph), in discussing the MWD project, the statement is made: "the 3.5 per cent interest rate was used in calculating the capital costs of the *entire* combination power and water plant–not just the water features." This is not true, and is refuted on page 381, numbered paragraph 2.

On page 108, fifth complete paragraph, the MWD project is stated to "provide just over 1.5 million acre feet of high quality water per year." The correct number is 150 000–not 1.5 million.

On page 128, the MSF design is criticized as having maximum efficiency at design thruput and a reduced efficiency at part load, in contrast to the LTV which has a high efficiency over a broad range of production rate. This is misleading. If we are talking about thermodynamic efficiency, this is solely a function of the temperatures at the hot and cold ends of the plant, and approach of the reject and product streams to the sink temperature, and this statement is equally true of both types. The MSF and LTV designs can both maintain the top and bottom temperatures over a wide range of production rate by manipulation of controls.

The description of the Buckeye, Arizona electrodialysis unit is excellent. An unfortunate omission is any reference to the actual capital cost of the facility or of the interest rate on borrowed capital.

The paper on "Problems and Potentials of Concentrated Brines" agrees in the main with most of the analyses of the value of brines as chemical sources, at least those that this reviewer has read. One facet that did not receive consideration is the fact that brines from distillation plants, and probably electrodialysis plants as well, where acid treatment of feed seawater is used, will have essentially zero residual alkalinity. This should be of direct benefit in the recovery of chemicals that require neutralization of alkalinity as a pretreatment. An example is bromine. Since the cost of acid is in the range of 10 to 15% of the cost of product water, the effect of sharing acid cost between a desalting plant and a bromine recovery facility would not be negligible.

One of the most interesting concepts presented at the symposium is contained in the final paper entitled "The Texcoco Project." This paper describes the serious problem facing Mexico City and the imaginative concept being pursued. If successfully concluded, this approach might not only provide Mexico City with needed water during its dry season, but also solve the critical subsidence being encountered in some areas of the city.

L. S. Galstaun is Manager of Process Engineering for Bechtel Associates, New York City. Previously he was Manager of Applied Technology for Bechtel Corporation's Scientific Development Department in San Francisco where his duties included management of projects in desalting, particularly the desalting portion of the Metropolitan Water District Study. His PhD is in physical chemistry (MIT, 1936).

A LITTLE NAIVE?

Title Irradiation Damage to Solids

Author B. T. Kelly

Publisher Pergamon Press, 1966

Pages xix + 232

Price $4.50 (paperback)

Reviewer James H. Crawford, Jr.

From its starting point as a series of rather pragmatic investigations of the effect of prolonged exposure to nuclear radiation on the physical behavior of solids, radiation damage as a field of research has taken a number of interesting twists and turns. It has progressed somewhat erratically from its initial preoccupation with "practical" nuclear materials, such as uranium and its alloys on the one hand and graphite on the other, to encompass nearly every class of crystalline solids, as well as some which are not crystalline. In the process, investigations employing energetic radiation as a tool with which to introduce lattice imperfections have had a profound impact upon our understanding of defects in solids and the interrelationships between these and physical properties. Matters as diverse as the nature of the dimensional changes and lattice expansion (and contraction) occurring in graphite, the nature of defect-energy levels which profoundly influence the electronic behavior of semiconductors and effects of radiation defects upon the superconducting transition fall within the bounds of this field of research. Indeed, the recent discovery that high-energy particles become channeled, i.e., move through very large distances with very little energy loss along open directions in crystals, has opened a wide area of delicate and sophisticated experimentation and has had some rather important consequences for nuclear physics as well as for solid state.

In the book under our scrutiny, Kelly has prepared a survey of the field with primary emphasis upon