

explain. The hard-rock geology and the qualities of the lake water, temperatures, and currents are amply treated. Maps of the bottom topography of each lake are furnished, with a contour interval of 100 feet.

Most of the book is devoted to glacial and postglacial history, interpreted against a background of four glacial stages and relatively much longer interglacial ages. The duration of time since the Ice Age and of successive intervals thereafter is critically discussed in the light of carbon-14 dating. The author confesses an attempt "to present a review which proceeds from the more probably correct interpretations to inferences that are less well founded, and to indicate the degree of doubt or certainty existing in the conclusions."

His more controversial points include a Two Creeks low-water stage; the concept of Valdres and Cochrane deposits as tills resulting from ice readvances rather than deep-water deposits of ice-berg drift; a claim that Lake Algonquin evidence is lacking in the Superior basin; and a return to consideration of supposed marine waters (Gilbert Gulf) in the Ontario basin. Hough considers the name *Champlain* no longer appropriate and suggests "St. Lawrence Sea" to replace it. This may create difficulties of nomenclature with respect to a classic time unit now being recognized in the Hudson Bay area and on the Pacific Coast.

Such incidents furnish problems for research in the future, and this research will be given stimulus by this interesting treatise.

RICHARD J. LOUGEE

*Graduate School of Geography,
Clark University*

Climatology and Microclimatology. Proceedings of the Canberra Symposium. UNESCO, Paris, 1958 (order from Columbia University Press, New York). 355 pp. Illus. \$11.

In October 1956 the Advisory Committee on Arid Zone Research of UNESCO sponsored a technical meeting in Australia. The theme was arid-zone climatology. This volume contains 50 papers which were presented at the meeting. It is a companion to an earlier UNESCO publication, *Arid Zone Research X* (Paris, 1958). This preceding volume contained the eight introductory addresses on the major phases of arid-zone climatology and microclimatology which opened the eight sessions of the symposium.

As one might expect, a wide compass of topics is covered. The session titles indicate this: "Evaporation and water

balance"; "Radiation and thermal balance"; "Interrelationships of climate and flora"; "Interrelationships of climatic elements and fauna"; "Microclimate of man and domestic animals"; "Modification of microclimate"; "Salting and chemistry of rainwater"; "Climatological observational requirements in arid zones."

The papers and the brief summaries of the ensuing discussions are very useful contributions to the subject of arid climates. This shares with other symposium volumes the problem of wide variety in scope and quality. In this case the variation is, fortunately, more in the size of the contributions than in the contents. Some papers are merely extended abstracts. A great many new data are presented. This is partially due to the fact that 31 papers were contributed by Australians and deal with the arid lands on their continent. Much of this material summarizes original research of the authors. Other areas of the globe were represented by—among others—such well-known experts as Thornthwaite, Geiger, Emberger, and Ramdas, so that a high standard of presentation was assured. A discourse by the U.S.S.R. academician Dzerdzeevskii gives a useful survey of aridity indices and defines an evaporation deficit concept which has been useful in the synoptic climatic analysis of dryness in Russia.

Most encouraging is the physical and quantitative approach now being taken in dealing with problems of arid climates that is apparent throughout the volume. This approach permits a clear assessment of the risks of land utilization in arid lands. It also leads to rational attempts at adaptation and amelioration. This symposium brings together the viewpoints of many minds and disciplines. It will stimulate thinking and new basic and applied research into the climatic problems of arid zones. The wisdom of UNESCO in promoting studies along this line is obvious if one considers, in frustration, the presently unusable dry lands of the earth that might help to relieve the increasing population pressure.

This volume on climatology is a worthy addition to the list of earlier UNESCO arid-zone symposia publications, such as those on human and animal ecology and on wind and solar energy. I regret that the anonymity of the editor of this volume prevents me from giving personal credit for excellent bilingual printing and beautiful make-up. The book can be highly recommended to meteorologists, agronomists, ecologists, geographers, and conservationists.

H. E. LANDSBERG

*Office of Climatology,
U.S. Weather Bureau*

The Physical Theory of Neutron Chain Reactors. Alvin M. Weinberg and Eugene P. Wigner. University of Chicago Press, Chicago, Ill., 1958. xii + 801 pp. Illus. \$15.

Research in the neutron physics of reactors is preponderantly done in large laboratories which generally issue their own reports. Since few of these reports are published in journals, even in abbreviated form, it has not been easy to infer from the readily accessible literature just what are the principle problems of the moment, and what methods are being used on them.

Weinberg and Wigner have now given us a work which goes far toward filling the partial void. This is a book which begins properly with a selective review of relevant parts of the theory of nuclear reactions, which proceeds to a thorough treatment of the transport of neutrons interacting with matter, and which then applies these subjects to the theory of neutron chain reacting systems. To this extent the book resembles others which have appeared in the past. The features which most distinguish this work from earlier ones are its thoroughness, its careful consideration of fundamental concepts, and the modern character of the treatment. For instance, this is the first general book on reactor theory to take into account the wide use of high-speed computing machines in dealing with reactor calculations, and to discuss the methods used.

These features, as well as the clear and precise language used, elevate the book into a class by itself. It will without doubt now become the standard work on reactor theory, both for reference and for teaching. As a text, some will probably choose to use it in advanced courses. It need by no means be used only at this level, however, because *The Physical Theory of Neutron Chain Reactors* presupposes no required prior knowledge of reactor theory. A good course in nuclear physics is, however, a prerequisite.

It is a pleasure to recommend this book, with no essential reservations, to all concerned in the field.

HERBERT KOUTS

*Brookhaven National Laboratory,
Upton, New York*

The Pulse of Radar: The Autobiography of Sir Robert Watson-Watt. Dial Press, New York, 1959. x + 438 pp. \$6.

In 1925 King George V asked scientists of the British Admiralty whether they could not detect aircraft by radio echo ranging in a fashion similar to the detection of submarines acoustically. His Majesty's scientists did not think the

suggestion was practicable. Ten years later the director of research of the Air Ministry asked Robert Watson-Watt what he thought about the use of death rays for air defense. Watson-Watt, who had directed the study of radio noise and radio storm tracking since World War I, replied that it would be difficult to obtain damaging radiation effects at a distance but that it would be quite practical to detect and to track aircraft by means of radio pulses. The government gave immediate support. Within a month the concept had been tested, and within a year the first coastal warning stations were being designed. In the short 4 years before the start of World War II, early warning, ground control of interceptors, field army defense, air-to-ship, ship-to-ship, and air intercept radars were designed, tested, and put into production. From this beginning came the many other radar systems, radio beacons, and radio navigation systems which played such a vital role in the last war.

The Pulse of Radar is this story and the autobiography of Sir Robert. The two are intimately related. This is primarily the history of the British program, since that is the story the author knows personally and since the development of radar in the United States has been adequately glorified in other works. The British program is the really exciting one.

This volume has value not only as stimulating technical history but, perhaps even more, because of the light it sheds on the science-government-military relationships which made possible such dramatic progress. Even though the problems of military science are now much more complicated and the incentive may not be as great as it was then, still, much could be done to reduce the lead time for military research and development. Much can still be learned from the experiences described in this book.

W. A. HIGINBOTHAM
Brookhaven National Laboratory,
Upton, New York

Les problèmes aux limites de la physique mathématique. Introduction à leur étude générale. H. G. Garnir. Birkhäuser, Basel, Switzerland, 1958. 234 pp. Illus. F. 29.

The simple Dirichlet problem is that of finding the temperature distribution in a solid when the temperature at the surface is prescribed; the Neumann problem differs only in that the heat flow across the surface, rather than the temperature itself, is prescribed. These problems are mathematically equivalent to those of finding a potential distribution

when the potential at the surface is prescribed in the one case, the potential drop across the surface in the other. Either problem leads to that of finding a function u which satisfies

$$\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 + \partial^2 u / \partial z^2 = 0$$

throughout the region while at the boundary either the value of u itself or that of its normal derivative is prescribed. By including additional terms involving the function itself, and perhaps its first and second derivatives with respect to time, one obtains the mathematical conditions satisfied by the concentration of a solute diffusing through a solvent, the flux of neutrons in a nuclear reactor, the amplitudes of propagated waves, the displacement of an elastic medium subject to small perturbations—to mention only a few of the concrete applications. A powerful tool for the construction and study of the solutions of these problems is provided by the formation of a Green's function, which amounts to forming certain special elementary solutions which, when properly compounded, provide the solution actually required.

The monograph under discussion generalizes the problem to n dimensions and phrases the boundary conditions in more general terms, permitting, in particular, the Dirichlet condition to hold in certain areas and the Neumann condition to hold elsewhere along the boundary. The treatment is strictly modern, being phrased in terms of Hilbert spaces and utilizing Schwartz distributions. However, the necessary theory is developed at the outset, only a background in the theory of real and of complex variables, including some acquaintance with Fourier and Laplace transforms, being presupposed.

A. S. HOUSEHOLDER
Oak Ridge National Laboratory

Economics for the Mineral Engineer. Edmund J. Pryor. Pergamon, New York, 1958. 254 pp. Illus. \$6.

Traditionally, the mineral beneficiation engineer has concerned himself with research and plant design. The problems of economics and management in the mining industry have been handled generally by those connected with development and ore production. Because of the ever-growing importance of ore concentration, this relationship is changing. It is essential that the mineral dresser of the future be well informed on the impact of costs, markets, and industrial relations.

There have been numerous books on mineral economics and mine valuation, all directed toward the geologist and the mining engineer. This is the first written specifically for the beneficiation engi-

neer, or the mineral engineer, as he is called throughout much of the British Empire. Such a treatise is long overdue and should be of value to the teacher and student of ore treatment. The book is designed for the advanced student or the young engineer-supervisor aspiring to management, rather than for the undergraduate. The author is a lecturer at the Royal School of Mines, with managerial and consulting experience. His use of the "King's English" is exceptional—a definite advantage in educating our engineers to write well.

The opening chapters present a concise exposition on the prospecting and sampling of ore deposits. The coverage of accounting as it relates to economics is based on British methods and symbols, and this tends to confuse the American student somewhat. However, the presentation of specific data on mill records and mill construction are of particular value to the neophyte. A section on "new plants" offers practical and sound advice.

The real value of the book lies not so much in specifics as in the philosophies it expounds. This is particularly true in the coverage given management, labor relations, and professional ethics. Here are points too seldom presented to the engineer in his highly technical training. The enlightened view in personnel problems and the development of social conscience, particularly in foreign operations, are stressed as necessities.

Since the book touches briefly on many subjects and lists an ample number of references, it should stimulate additional reading on mineral economics. Some chapter revision seems warranted. Certainly "Incentive bonus" and "Hiring and firing" would be better under "Management" than under "Mill records." The "Glossary" is a definite contribution, containing definitions often hard to find.

EUGENE P. PFLEIDER
Department of Mining Engineering,
University of Minnesota

Introduction à l'étude des variétés kählériennes. Publications de l'Institut de Mathématique de l'Université de Nancago, VI. André Weil. Hermann, Paris, 1958 (order from Pierre Berès Inc., New York). 175 pp.

A surface, in Euclidean space, can be examined from (at least) two points of view. The Euclidean concept of distance induces, on the surface, a metric which has found its historical expression, in terms of local coordinates, by means of a quadratic differential form for arc length. On the other hand, Euclidean space can be embedded in complex projective space so that Euclidean geometry