tative scholarship but with occasional pauses to enlarge upon the features of the language of science that are of interest to the nonspecialist.

The essence of the book is summed up in its final paragraph: "This book has tried to demonstrate the existence of a real language of science and to detect something of its strength and its weakness. Its strength will be enhanced, its weakness will be concealed, and its power for good will become greater as scientists turn their abilities to using it more effectively."

DONALD J. LOVELL

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The Hand-Produced Book. David Diringer. Philosophical Library, New York, 1953. 603 pp. Illus. $15.

David Diringer, author of a previous book entitled *The Alphabet: A Key to the History of Mankind,* has produced a sequel to that work in which he traces the evolution of the written document from the earliest beginnings down to the invention of printing. His title may need further explanation. He is not concerned with the making of books as we know them. Although he himself (p. 24) asks the question, "What is a book?" he does not provide a definition but confines himself to a discussion of the various etymologies. What *The Hand-Produced Book* is really concerned with is the history of written communication.

Dr. Diringer starts with primitive modes of communication, beginning with the first crude drawing that man made in the sand. He then discusses the gradual improvement in communication from the cave drawings and stone carvings to the relatively sophisticated clay tablet books and finally to papyrus books.

It was the discovery of the utility of papyrus that made written communication easy and convenient and made possible the writing of books roughly as we know them. It also gave to European languages their words for paper. Papyrus was a technologic development of the ancient Egyptians who first discovered that the stems of the reedy plants growing in their Nile marshes could be flattened out, glued together in sheets, and used for writing. Papyrus remained an Egyptian monopoly, "but for a thousand years," says the author, "it was the chief writing material for the Graeco-Roman world . . . and was used both for literary and for ordinary purposes such as legal documents, receipts, petitions, notices of birth, and official and private letters (p. 125)."

Parchment and vellum developed naturally from the use of tanned leather as writing materials—how early, no one knows with certainty. But by the second century B.C., parchment, prepared by scraping skins on both the hair and flesh sides and rubbing with pumice stone, had come into fairly common use in Egypt and Asia Minor. The finest grade of parchment vellum, made from calfskin, was used for valued documents. The early craftsmen learned to prepare a particularly fine-grained white vellum from the skin of aborted calves, a type known technically today as uterine vellum. With papyrus, parchment, and vellum as satisfactory writing materials, the ancient world could produce written documents in quantity. During the Middle Ages in western Europe, parchment was widely used for the multiplication of books and other documents.

Diringer's volume provides encyclopedic information about an infinite variety of matters that impinge on writing: the kinds of writing materials used in different countries and regions, the instruments used for writing, including a discussion of inks, pigments, and pencils, and methods of multiplying manuscripts. He ranges over the pre-Columbian Mayas and Aztecs in America, a mysterious riddle that, like the ancient Etruscan writing, remains unsolved.

Many points in the book are controversial, and scholars will not of course agree with all of the author's conclusions, but he provides a stimulating body of information and bibliographical clues for further investigation. Although one of his theses, that the book follows religion, has much to commend it, this is an oversimplification of the complex problem of the reasons for the development of the book. The dust jacket announces that the volume was written primarily "for the cultured layman" and not for specialists. It is not a work however, that one can read easily, for even within chapters it is a succession of sometimes disjointed paragraphs on a wide variety of loosely connected topics. A tendency to repetition and many parenthetical cross references and allusions further retard the reader. But with all of its faults, *The Hand-Produced Book* is both an interesting and useful encyclopedia of information on the written document before the beginning of printing in Europe. The profuse illustrations also add to its value.

LOUIS B. WRIGHT

The Folger Shakespeare Library
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Ideologie und Forschung in der Sowjetischen Naturwissenschaft. Schriftenreihe Osteuropa, No. 1. Arnold Buchholz. Deutsche Verlags, Stuttgart, 1953. 126 pp.

Propaganda and counterpropaganda have aroused passions to the point where calm and rational consideration of anything pertaining to the USSR has become a rarity. The book under review belongs to this rare class. The author describes the present situation of science in the USSR and, to some extent, its historical background, with calm and detachment as well as with knowledge and understanding. The book is obviously too short for a thorough coverage of fields as diverse as mathematics, physics, astronomy, chemistry, biology, and agriculture. It is, however, hard to imagine how one could pack more information in every paragraph than the author succeeds in doing. The documentation and references are extensive and, in every instance where the reviewer is competent to judge, accurate.

The evaluations made by the author will assuredly be attacked from the left as well as from the right, since they will appear too severe to some and too lenient to others. In any case, the author did not succumb to the facile generalizations that are so tempting to amateur and to professional propagandists.

Science in the USSR is neither all destroyed nor progressing by leaps and bounds. The situation is more complex than this. In some respects, science enjoys unprecedented opportunities. On the other hand, there is the cancer of Lysenko, which has been nurtured by those in power in blissful ignorance of the fact that he is the most efficient wrecker ever to afflict their biology and agriculture. Furthermore, the situation is fluid, and the future, possibly a very near future, may bring changes and surprises which the author is wise not to attempt to predict.

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Climatic Change: Evidence, Causes, and Effects. Harlow Shapley, Ed. Harvard Univ. Press, Cambridge, Mass., 1953. 318 pp. Illus. + plates. $6.

The title of this volume suggests a meteorological discussion, but only three of its 22 chapters are devoted to meteorology as such. Instead, numerous ramifications of climatic changes, their causes and effects, are discussed. Here one finds such varied topics as radiocarbon dating, tree-ring studies, soil geology, analysis of lake sediments, Pleistocene glaciation, and the relationship of climate to human racial characteristics. Two chapters give excellent and concise summaries of the paleontological and paleobotanical evidence for changes of climate. It would be difficult to imagine a wider assortment of scientific fields, all directly connected with a single main theme.

An introductory chapter by Dr. Shapley includes speculations on the possibilities of life under climatic conditions of other planets. The other 21 authors include meteorologists and climatologists, an anthropologist, several astronomers, a paleontologist, two botanists, a zoologist, and several geologists. The majority are on the Harvard and Yale university staffs. The coordination of chapters is good on the whole, for each author treats a well-defined area that fits into a planned sequence. The lack of a general index is somewhat inconvenient.

Much space is devoted to the problem of the Pleistocene glaciations. The great question of how the vicious circle can start is only slightly less difficult than its logical sequel: once an ice age is established, how can it ever end? Ice begets more ice, as C. E. P. Brooks pointed out some years ago, and some drastic change is required to remove it, once it has taken hold.

Substantial progress has been made since Croll offered his precessional hypothesis, which has been revived more recently in a more precise form by Milankovich. The evidence now seems rather clearly opposed to all such purely geometric astronomical explanations. At best, they can probably account only for minor waves superimposed on the main trend (for example, the variations in the varves of the Green River formation of Eocene age). The geologically rapid alternation of glacial and interglacial episodes is fatal to hypotheses that rely chiefly on elevation of the continents and mountain building. Still, the reviewer finds it hard to avoid the compulsion in the circumstances that two tremendous glaciations (Permocarboniferous and Pleistocene) each followed a few million years after a tremendous orogeny. (Extensive pre-Cambrian glaciations cannot yet contribute clear evidence on this point, owing to difficulties of correlation). It seems at least probable that elevation plays a part in setting the stage.

A recurring theme is the recognition that ice ages represent an accentuation and equatorward shift of climatic zones. It is significant that postglacial times have witnessed cycles that differ only in their shorter periods and lesser amplitudes. All other agencies having failed, the basic cause of world-wide climatic change is considered to be probably solar variation. The naive idea that less radiation would bring an ice age has long been abandoned. Greater radiation is required to increase evaporation and precipitation. But Miss Bell presents the hypothesis in a new form, according to which the earth, especially the oceans, must have been precooled by a cooling of the sun, after which increased activity brought on extensive snowfall. This seems to be the most promising idea yet proposed. Other suggestions concerning effects of solar corpuscular radiation can best be evaluated after we have more definite information. At present we can only regard them as hopeful speculations.

Two decades ago the authors of such a book would probably have felt obliged to refute the hypothesis of continental drift. In this volume it is dismissed quite casually, when mentioned at all. The strongest point in its favor is the Permocarboniferous ice age in and near the tropics, which remains the greatest of all geologic climatic enigmas.

Climatic Change states a problem and discusses its present status but only suggests possible directions in which the solution may lie. There is much in the book that is new and original, to which a brief review cannot do justice. It is well written, far above the "popular" level, and is stimulating and highly informative reading for the scientist or scholar who is not a specialist in climatology.

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Astronomy and Mathematics

Dialogue on the Great World Systems. Galileo Galilei. In the Salusbury translation. Revised and annotated by Giorgio de Santillana. Univ. Chicago Press, Chicago; Cambridge Univ. Press, London, 1953. 506 pp. Illus. $12.50.

Dialogue Concerning the Two Chief World Systems—Ptolemaic & Copernican. Galileo Galilei. Translated by Stillman Drake, foreword by Albert Einstein. Univ. California Press, Berkeley, 1953. 496 pp. Illus. $10.

Galileo's monumental defense of the Copernican system, the *Dialogue on the Two Principal World Systems,* has been virtually inaccessible in English since the Great Fire of London destroyed most copies of Thomas Salusbury's 17th-century translation. Until 1953 the fire damage was not repaired. Most English and American readers have known Galileo only through his *Discourses on Two New Sciences.* Now two English editions appear simultaneously: one, a brilliant revision of Salusbury's clumsy and inaccurate translation; the other, a completely fresh