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.

THEODOSIUS DOBZHANSKY
Department of Zoology, Columbia University

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.

DEAN B. MCLAUGHLIN
The Observatory of the University of Michigan

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