of various degrees of difficulty, on the mathematical and quantitative aspects of population genetics, including an impressive contribution by the young Japanese Motoo Kimura. Following these two sections are others on selection in plants, selection in animals, genetic variability and polymorphism, populations in time and space, and the integration of genotypes. The whole is preceded by a masterly introduction by Dobzhansky and followed by a fine summary by Lerner.

It is hopeless to attempt a full summary of the contents. Instead, let me merely mention two subjects, the importance of which for human evolution has only recently been realized, which are well presented. These are rapid evolution (by E. B. Ford) and polymorphism in man (by A. Allison).

This volume is a must for all those interested in population genetics, human evolution, anthropology, or any one of a number of other disciplines. Like the other volumes, it is well printed on good paper, and there is an index.

WILLIAM C. BOYD
Boston University School of Medicine

The Future of Arid Lands. Papers and recommendations from the International Arid Lands Meeting. Gilbert F. White, Ed. American Association for the Advancement of Science, Washington, D.C., 1956. 453 pp. Illus. $5.75, members; $6.75, others.

Of the earth's 52 million square miles of land surface, about 35 percent, or more than 18 million square miles, are in the arid or semiarid zone. Just to administer such an area would present problems. Added to the normal problems, others resulting from the climatic, economic, and social instability inherent in the arid regions greatly complicate the government of more than one-third of the earth. Just how complicated the situation is, is discussed in *The Future of Arid Lands.*

This book is a symposium comprising the 31 papers and three statements presented at the International Arid Land Meetings in Socorro, N.M., during April and May, 1955. Scientists from 17 countries participated. The meetings were held under the auspices of the AAAS, with support from UNESCO, the National Science Foundation, and the Rockefeller Foundation.

The papers read at the meetings were prepared in an attempt to answer, or at least to discuss, specific questions: What is the future of the arid lands? Is there any way we can either predict or modify the variability of water supply? Can we utilize the arid lands permanently? Are there sources of water now unused which may be tapped in the future? Can we find or develop plants and animals better adapted to arid conditions?

The tenor of the discussion is well stated by H. O. Sternberg of Brazil: "It is hard enough to develop a system of land use which fully considers ordinary conditions; to contend with unusual circumstances really calls for additional determination, organization, skills and capital." Insofar as answers to the specific questions are concerned, there seemed to be considerable doubt about what might be accomplished.

It is generally agreed that there is little hope of long-range prediction of amounts of precipitation in arid regions, and that there are no distinct drouth cycles. To judge from the reported experience of those working on arid lands in Africa, there is little to be expected from groundwater development. Ground water is too hard to find and, when found, may be too salty.

Throughout the symposium the distinction is made between "oasis" development and land use under local precipitation. Oasis development is dependent on the importation of water from a more humid area. Thus, in an arid region, the extent of development is dependent on the water supply, not on the availability of lands. There appear to be differences of opinion on the objectives of irrigated-land use. C. E. Kellogg, of the United States, thinks that crops grown on irrigated land should be restricted to those which would aid the economy of the surrounding dry-land area. Other authors indicate that the greatest returns from irrigation come from the production of specialty crops which cannot be grown in some seasons in humid areas.

There is much lack of agreement on the best utilization of arid and semiarid land without irrigation. J. Tixeront, of Tunisia, points out that the lack of water and the variability of the climate have numerous economic, social, and political consequences and concludes that nomadism is, therefore, obligatory for complete utilization of very arid areas. His conclusion that the arid regions cannot exist by themselves can be viewed in two ways—a justification for the domination of arid regions by their more fortunately watered neighbors or a realistic evaluation of the need for subsidy to arid regions. (Our own arid West under the present drouth is one example.) If true, this dependence must act as an automatic brake on the drive toward nationalism of some of the Near East nations so much in the news today.

The attitude of the technicians in the many fields represented at the conference is of great interest to me. The meteorologist insists that we cannot solve the arid-land problem without a thorough knowledge of meteorology. Likewise, the soil scientist. The geologist stresses the need for a thorough knowledge of his subject in a search for ground water, and the hydrologist is dismayed at the lack of information relating rainfall and runoff—even more dismayed at the difficulty in collecting adequate data.

No doubt there is much to be said for the modern scientific approach to a solution of land-use problems in the arid regions. But H. L. Shantz, of the United States, reports that olive culture, when practiced as it was in Roman times, is successful today. Frank Dixey, of the United Kingdom, cites instances which indicate that ancient peoples had a precise knowledge of the ground water in North Africa. Pedro Armillas, of Mexico, relates in some detail how archeological studies have shown a high degree of development of arid and semiarid land in pre-Columbian America. E. Evenari and Koller, of Israel, make the following statement: "It is thrilling to see time and time again how the present-day dispositions of highly complex irrigation systems, calculated by trained specialists, with the latest technical aids, coincide with remnants of ancient irrigation systems on the same spot."

The question immediately arises, who were the scientists in those days? If there were none, why were these ancient peoples reasonably successful? Is our real problem the need to know the smallest details of each technique and to collect a measurement of each physical phenomenon? The Roman experience seems to be that, under certain circumstances, the problems of climate can be overcome, to a considerable extent, by reasonable observation of physical conditions and the free application of common sense.

But the other face of the coin was presented by R. O. Whyte, of the Rome staff of the U.N. Food and Agriculture Organization, who argued that much of today's desert area is man-made. This conclusion follows the assumption, also made by others, that there has been no climatic change. Thus, those areas which do not now support agriculture, despite indications of having once done so, are considered to be the results of man's misuse of land.

Almost every participant in the conference warned of the danger of misuse of arid land. This point was emphasized by C. Luker and R. Price of the United States. Nevertheless, there was no agreement about whether there had been major swings in climatic conditions and no agreement on the basic phenomena which control the erosion problem.

Participants in the conference held little hope that there would be new sources of water, either from demineralization of saline waters or from increased precipitation. On the other hand, considerable optimism was expressed concern-

ing our ability to modify plant and animal strains to make them better adapted to desert conditions. Thus, there is, in some fields, room for a great deal of effective work.

The collection of conference papers is a welcome contribution to efforts to educate people in the problems of our use of the arid lands. For those who must deal with the vexing problems of arid-land administration, it can provide no solace beyond that found in the old saying that "misery loves company." Nevertheless, this conference has taken a look at many important considerations, which could be pursued.

For example, should we try to enforce the same social, economic, and political framework in the arid-land regions as has been developed naturally in areas of greater climatic stability? If we do not do so, what pattern should the new framework take? Would the different patterns in arid- and humid-land areas be compatible?

Another line of fruitful inquiry would be, how do we deal with the people involved. This appears to be the crux of the matter. Which has the greatest influence on the erosion problem—a knowledge of whether a drouth has a 5-year or a 10-year recurrence interval or existence of a society that measures its wealth in numbers of cattle, irrespective of quality or salability? What is the minimum standard of living to be expected in desert areas, and what happens when the standard of living of adjacent areas is raised?

All of these were barely touched at the Socorro conference. It would seem that something along these lines might well be the subject of discussion at the next conference.

THOMAS MADDOCK, JR.
U.S. Bureau of Reclamation

Books Reviewed in The Scientific Monthly, April

A Life of Sir William Ramsay, M. W. Travers (Arnold). Reviewed by R. Multhauf.

Science and Civilisation in China, J. Needham (Cambridge Univ. Press). Reviewed by W. C. Boyd.

Biological Treatment of Sewage and Industrial Wastes, J. McCabe and W. W. Eckenfelder, Jr., Eds. (Reinhold). Reviewed by I. E. Wallen.

A Space Traveler's Guide to Mars, I. M. Levitt (Holt). Reviewed by R. Fleischer.

The Old Stone Age, M. C. Burkitt (New York Univ. Press). Reviewed by R. F. Herzfeld.

The World of Mathematics, J. R. Newman (Simon and Schuster). Reviewed by H. W. Syer.

The Earth We Live On, R. Moore (Knopf). Reviewed by J. Kaikow.

On Freedom and Free Enterprise, M. Sennholz, Ed. (Van Nostrand). Reviewed by A. E. Burns.

New Books

Canon Photography. A working manual of 35 mm photography with the Canon V and IVS2. Jacob Deschin. Camera Craft, San Francisco; Fountain Press, London, 1957. 192 pp. $5.95.

Intelligence in the United States. A survey—with conclusions for manpower utilization in education and employment. John B. Miner. Springer, New York, 1957. 180 pp. $4.25.

The Importance of Overweight. Hilde Bruch. Norton, New York, 1957. 438 pp. $5.95.

Integration. Edward J. McShane. Princeton University Press, Princeton, N.J., reprint, 1944. 394 pp. Paper, $2.95.

Quelques Problèmes de Chimie Minérale. Rapports et discussions publiés par les Secrétaires du Conseil sous les auspices du Comité Scientifique de l'Institut. Institut International de Chimie Solvay. R. Stoops, 76–78 Coudenberg, Bruxelles, 1956. 544 pp. Paper, F. 590; Cloth, F. 675.

Logic without Metaphysics. And other essays in the philosophy of science. Ernest Nagel. Free Press, Glencoe, Ill., 1956. 433 pp. $6.

A Natural Science of Society. A. R. Radcliffe-Brown. Free Press, Glencoe, Ill. 1957. 156 pp. $3.50.

The Calculation of Atomic Structures. Based on lectures given under the auspices of the William Pyle Fund of Haverford College, 1955. Douglas R. Hartree. Wiley, New York; Chapman & Hall, London, 1957. 181 pp. $5.

The Criminal, the Judge, and the Public. A psychological analysis. Franz Alexander and Hugo Staub. New chapters by Franz Alexander. Original edition translated by Gregory Zilboorg. Free Press, Glencoe, Ill. rev. ed., 1956. 239 pp. $4.

Advances in Geophysics. vol. 3. H. E. Landsberg, Ed. Academic Press, New York, 1956. 378 pp. $8.80.

Archaeology and Its Problems. Sigfried J. De Laet. Translated by Ruth Daniel. Macmillan, New York, 1957. 136 pp. $4.50.

Bones for the Archaeologist. I. W. Cornwall. Macmillan, New York, 1956. 255 pp. $10.

International Code of Botanical Nomenclature Adopted by the Eighth International Botanical Congress, Paris, July 1954. J. Lanjouw, chairman of editorial committee. International Bureau for Plant Taxonomy and Nomenclature of the International Association for Plant Taxonomy, Utrecht, Netherlands, 1956. 388 pp.

Aerodynamic Components of Aircraft at High Speeds. vol. VII, *High Speed Aerodynamics and Jet Propulsion.* A. F. Donovan and H. R. Lawrence. Princeton University Press, Princeton, N.J., 1957. 845 pp. $17.50.

Introduction to the Geometry of Complex Numbers. Roland Deaux. Translated by Howard Eves. Ungar, New York, 1956. 208 pp. $6.50.

Anleitung Zum Praktischen Gebrauch der Laplace-Transformation. Gustav Doetsch. Oldenbourg, München, Germany, 1956. 198 pp. DM. 22.

Scientific Inference. Harold Jeffreys. Cambridge University Press, New York, ed. 2., 1957. 236 pp. $4.75.

Theory of Lie Groups. I. Claude Chevalley. Princeton University Press, Princeton, N.J., 1946. 213 pp. Paper, $2.75.

Introducing Astronomy. J. B. Sidgwick. Macmillan, New York, 1957. 259 pp. $3.50.

The Physiology of Nerve Cells. John C. Eccles. Johns Hopkins Press, Baltimore, 1957. 270 pp. $5.75.

Demographic Analysis. Selected readings. Joseph J. Spengler and Otis D. Duncan. Free Press, Glencoe, Ill., 1956. 819 pp. $9.50.

The Dentition of the Australopithecinae. Transvaal Museum Memoir No. 9. J. T. Robinson, Transvaal Museum, Pretoria, S.A., 1956. 179 pp.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, *but to the publisher or agency sponsoring the publication.)*

Report of the Explosion at the Metallurgical Laboratory of Sylvania Electric Products, Inc. on 2 July 1956. Submitted to Governor Averell Harriman by the Council on the Use of Nuclear Materials. State of New York, Albany, N.Y., 1957. 50 pp.

A Reconnaissance of the Ceramic and Refractory Clays of Western Australia. Div. of Industrial Chemistry Tech. Paper No. 2. R. W. Cox, A. C. Frostick, W. G. Garrett, W. O. Williamson. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1956. 92 pp.

Genetic Studies with Bacteria. Publ. 612. M. Demerec *et al.* Carnegie Institution of Washington, Washington, 1956. 136 pp. $1.

Contributions on Partially Balanced Incomplete Block Designs with Two Associate Classes. NBS Applied Mathematics Ser. No. 47. Willard H. Clatworthy. National Bureau of Standards, Washington 25, 1956 (order from Supt. of Documents, GPO, Washington 25). 69 pp. $0.45.

Office Noise Studies at Hill Air Force Base. WADC Tech. Note 56–58. ASTIA Document No. AD 110645. Leo L. Beranek *et al.* 1956. 64 pp. *A Compilation of Turbojet Noise Data.* WADC Tech. Rept. 54–401. Norman Doelling, Derwent M. A. Mercer, *et al.* 1957. 126 pp. Wright Air Development Center, Air Research and Development Command, United States Air Force, Wright-Patterson Air Force Base, Ohio (order from ASTIA Document Service, Knott Building, Dayton 2, Ohio).

Central Laboratories for Scientific and Industrial Research, Hyderabad. Annual report. The Laboratory, Hyderabad, India, 1956. 80 pp.