

## Book Reviews

### The Roles of Man and Nature

**Black Sand.** Prehistory of northern Arizona. Harold S. Colton. University of New Mexico Press, Albuquerque, 1961. viii + 132 pp. Illus. \$4.

One of northern Arizona's prominent landmarks is the cinder cone known as Sunset Crater, a label inspired by its red-tinged rim. It stands as a relic of the Southwest's most recent volcanic activity. Declared a National Monument in 1930, it is admired annually by thousands of visitors and climbed by the hardy few. The convulsion of nature that formed it happened just before A.D. 1070. In addition to the 900-foot-high cone, the then-prevailing winds, out of the southwest, carried the ejected material northeasterly to blanket 800 square miles with black ash. It is this feature of the landscape which gives the book its name.

By all odds, the most fascinating episode in *Black Sand* is the narrative of the human experience before and after the ash fall, as reconstructed from the archeological record: of how man faced this cataclysmic event and adapted his life to the conditions of this near-unique microenvironment, and then of how, at least in part, by his own exploitation he brought on decreasing productivity of the soil which forced his eventual withdrawal from the area.

The rank and file of archeological reports are dust-dry and carefully plotted reviews of the data brought to light by the shovel. Only after many of them have been written can a book like *Black Sand* emerge. Its author, Harold S. Colton, founder and until recently director of the Museum of Northern Arizona in Flagstaff, bases this synthesis on 42 years of experience as an archeologist in the San Francisco Peaks region of northern Arizona. The depth of this experience clearly comes through as the book's pages recreate a thousand years of history of an unlettered people. The reader, not familiar with the ways

of the archeologist, will find help in the early chapters: the multidisciplinary approach, for example, employed in determining the time of the eruption of Sunset Crater, the method used to erect the tree-ring time scale, and the manner of relating this all-important dimension to the cultural vestiges as a basis for understanding human progress.

The principal characters in this story are the Sinagua, the archeologist's label for a people, taken from a characteristic of the country (Spanish for *without water*). The Sinagua were a dry-farming, pit-house-dwelling, rural folk who changed little from A.D. 500, when their presence is first detected, to the time of the volcanic eruption in the 11th century. The widespread mantle of black ash ejected from the volcano changed all of that, however, because it insulated the ground against the usual quick loss of soil moisture in a region where evaporation is high. Corn, beans, and squash could now be planted in many places previously impossible to cultivate.

A land rush followed, bringing new people, notably the Hohokam from the desert, and new ideas, skills, and crafts. For a century, all was well; masonry homes sheltered the expanding population in larger and larger, tightly packed communities, and there were related gains in cultural richness. But by 1300 the tide had changed, and the region was almost depopulated. Colton makes a good case for this shift in Sinagua destiny by attributing it to the gradual loss of farming capacity from wind erosion of the black ash, to increasing aridity in the terminal decades of the 13th century as recorded in tree-rings, and to a deteriorating health level arising from crowded living and deficient diet. But the Sinagua retreat at this time was not unique, for the entire northern frontier of Pueblo Indian territory was being badly shaken up, too. The principal force may well have been climatic.

*Black Sand* also reviews interestingly

the neighbors of the Sinagua and ancient commerce and farming; it also has a brief but challenging chapter on population density and trends. It is something of a shock to learn that between the 110th and 112th meridians in northern Arizona the population in 1950 was only a shade higher (4000) than it was 1350 years before (3000) and that the population peak (23,000) came at A.D. 1000.

A brief chapter, entitled "Drawings on rock," I heartily recommend to those countless correspondents who want to know the meaning of the petroglyphs found in the Southwest.

Certain risks inevitably accompany attempts to popularize one's work. Omissions, whether substantive or otherwise, are often demanded by simplification. *Black Sand* is not free of these. Most difficult to understand is why the bibliography was not updated to include contributions of the past decade. Nonetheless, Colton has produced a useful and exceptionally readable book about a colorful part and period of the American Southwest.

EMIL W. HAURY

Department of Anthropology,  
University of Arizona, Tucson

### Plant Physiology in Russia

**Wintering of Plants.** I. M. Vasil'yev. Jacob Levitt, editor of the English translation. Translated from the Russian by Royer and Roger, Inc. American Institute of Biological Sciences, Washington, D.C., 1961. xiv + 300 pp. Illus. Members, \$8; nonmembers, \$9.

As noted in the foreword, this is the first in a contemplated series of translations of recent contributions to plant science published in the Russian language. A committee appointed by the American Botanical Society selected the book to be translated, supervised the translation, and edited the final form. The first part of the book deals with injury to and the death of plants during the wintering period, the second with the physiology of winter resistance, and the third with the development of winter-resistant forms of plants. The table of contents provides an extensive outline of the book, and each chapter is terminated by a succinct summary.

The first two sections represent, in general, comprehensive and scholarly

treatments of extremely important phenomena in the life of plants, and they reveal a field of investigation that has received relatively little attention elsewhere. But, unfortunately, the third section contains a reiteration of the Lysenko theme of the inheritance of acquired characters. This is exemplified by the following quotation (page 222), "All hereditary changes in hardness begin with the so-called phenotypic changes in individual development. If they arise in young cells, they become fixed in the individual development of the organism in all its parts or in specific organs depending on what develops from these cells. If changed cells become the source of sexual or vegetative cells from which new organisms originate, the newly acquired hardness is transmitted to the offspring." An examination of the separate bibliography of foreign authors reveals no references on genetics after 1944, although the Russian edition of the book appeared in 1956, and the text certainly gives no evidence that the author is conversant with modern interpretations in this field. Despite these lapses in the field of genetics, this volume constitutes a distinct contribution to the field of plant physiology.

Although the committee is to be commended for this initial effort, one might suggest that future translations should have editorial comments that supplement, clarify, or correct the Russian text.

WM. T. JACKSON

*Department of Biological Sciences,  
Dartmouth College*

## Theory and Practice

**Work-Study Programs.** Appraisal and report of the study of cooperative education. James W. Wilson and Edward H. Lyons. Harper, New York, 1961. xii + 240 pp. \$3.50.

Although the first college program in cooperative education (alternating periods of work and study) was initiated at the University of Cincinnati in 1906, the first comprehensive survey and evaluation of the results has just been made. Financed with foundation grants and planned by a nationwide committee of educators, the 240-page report, cited above, has now been published.

The survey was an intensive one involving selected colleges of liberal arts, business administration, and engineer-

ing, each of which was paired with a similar institution that had not used the cooperative plan. Data were gathered from students, faculty, and employers.

The findings are favorable toward the work-study idea; recommendations include those for improving and for extending the programs. The quotation from the introduction, by Ralph W. Tyler, chairman of the study committee, catches the optimistic tone of the report:

"Cooperative education has important values for colleges and universities, for students and employers. These values should be given wide publicity and cooperative programs in American higher education should be greatly extended" (page 14).

A few of the committee's conclusions may be of special interest:

"The academic potential of cooperative students is equal to that of non-cooperative students" (page 155).

"The cooperative experience provides meaningful opportunities for the student to see the relevance of theory to practical situations and affords him opportunities to practice making applications. . . . It is the judgment of the committee and staff that this study lays to rest suspicion that cooperative education is anti-intellectual and over-practical" (pages 155-156).

"Cooperative education makes a positive contribution to society by attracting able young people to college who might otherwise never consider continuing their education beyond the high school" (page 156).

". . . the cooperative plan makes possible the more effective utilization of college facilities" (page 157).

An evaluation of any educational program is extremely difficult to make. For example, students and alumni tend to be biased in favor of whatever institution and type of program they attend. Hence the comparisons made on the basis of opinions do not reveal the full strength of the program in question. Subscribing as I do to the theory of the educative value of experience as advocated by Pestalozzi, Froebel, Dewey, and others, I believe the findings understate the values of the cooperative plan. The plan has significance for liberal education beyond that found in this study, which did not examine the liberal arts program as fully as it did the two more applied fields.

ALGO D. HENDERSON

*Center for the Study of Higher  
Education, University of Michigan,  
Ann Arbor*

## New Approach

**Industrial Dynamics.** Jay Forrester. M.I.T. Press, Cambridge, Mass.; Wiley, New York, 1961. xv + 464 pp. Illus. \$18.

*Industrial Dynamics* represents a radically new and different approach to the problems of industrial management. The author attempts to provide a common framework for the separate functional areas of management activity (production, marketing, engineering, and the like), in terms of flows of money, orders, materials, personnel, and capital equipment, all integrated by an information network. To accomplish this he developed a methodology for building mathematical models of industries or firms and a computer program to compute the complex interactions of the models. By varying inputs on the computer runs, the technique is supposed to reveal critical system variables that can then be manipulated to achieve better results in the management of an enterprise.

One strength of the approach advocated by Forrester is that he has not succumbed to the current craze of mathematical elegance for the sole sake of elegance. The parameters and constants used have meaning in the real world modeled, and he has not fallen into the trap of making unwarranted assumptions and elaborating on them. The concepts and techniques are not beyond the comprehension of a good engineering or science undergraduate.

The book provides the tools for the interested reader to challenge old management clichés, myths, and shibboleths—the author is an industrial iconoclast. Indeed, in the core analysis of a hypothetical production-distribution system, Forrester shows that "small changes in retail sales can lead to larger swings in factory production," owing to the internal characteristics of the system itself. This model also disclosed that "reducing clerical delays may fail to improve management decisions significantly," that "a factory manager may find himself unable to fill orders although at all times able to produce more goods than are being sold to consumers," and that "an advertising policy can have magnifying effect on production variations."

This book's major shortcoming is the lack of confirming data from the organizations modeled. For example, a model of an electronics firm produced evidence that a violently fluctuating