Textbook in Ecology

Among the textbooks in ecology that have been published in recent years Robert L. Smith's **Ecology and Field Biology** (Harper and Row, New York, 1966. 702 pp., illus. $12.75) must be classed as better than average. In places it is good. Its chief defect is that it includes too much. The price of this is the lack of any clear theme. A rather prosaic style of writing is compensated for by the beautiful production, including superb illustrations. The book is intended for college juniors or sophomores, but I suspect much of it will go beyond their needs.

The book starts off with an orthodox conception of the community and proceeds then to cycles of elements and energy flow in communities. These concepts are dealt with as matters of fact. They could be dealt with in a much more exciting way to impress on young minds the necessity of knowing about these interrelations. In the description of the nitrogen cycle, for example, no suggestion is made about the essential role of nitrifying microorganisms and denitrifiers for the presence of life on this planet. A quantitative approach to cycles could have driven that message home. The roles of temperature, moisture, and light are inadequately treated, and again a quantitative approach is lacking.

There follows a chapter on "biological clocks." As an elementary synopsis it is excellent, but why put it in there? Back again to communities, but this time to discuss succession without much emphasis on causes. Twelve chapters on different sorts of habitats are each concluded with "suggested field activities" without much indication as to the point of these activities. This is followed by a brief chapter on the somewhat discredited concept of biomes.

The two chapters on population biology contain some useful information, but it is information without a message. Yet the contribution of Lotka and other demographers to our thinking on death rates, birth rates, and rates of increase is profoundly important to an appreciation of what is happening to man in the modern world. Few elementary students, or graduate students for that matter, appreciate the importance of expressing births and deaths in terms of age schedules or the importance of net reproductive rates and intrinsic rates as opposed to gross rates of increase. The data are given but their significance is missed. As an exposition of population regulation this section is over-simplified and to that extent quite misleading.

It is good to see three chapters on evolution in an ecology text. The three concluding chapters on behavior are also welcome and are well oriented toward problems in ecology. The bibliography is quite enormous for an elementary book and is organized in a very helpful way. The book concludes with five appendices on statistics, measurements of temperature, light, and moisture, plant community analysis, some ways of measuring numbers of animals, and some suggestions for studying behavior in the field. I think the space in this section could have been more effectively devoted to specific studies that a class of students might make.

At the end, one is left wondering why ecologists make many of the measurements they do on ponds and forests and fish and birds. Perhaps it is just an occupational hazard of ecologists not to reason why. Modern ecology can be more than a compendium of facts, but somehow elementary texts do not succeed in conveying this. This book is no exception.

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Tensor Calculus for Students

J. Abram's **Tensor Calculus through Differential Geometry** (Butterworth, London, 1965. 176 pp., illus. $7.50) is designed for students. Four of its eight chapters apply tensor methods to differential geometry, one to the mechanics of continuous media, and one to dynamics. A surprisingly large amount of material is covered—for example, the theorem of Schur in Riemannian geometry.

Only a slight knowledge of linear algebra and of vector calculus is presupposed, not much more than is presented in many current textbooks on the calculus of Newton and Leibnitz. By illustrating the need for a nonorthonormal vector basis in the context of polar coordinates in the plane, Abram motivates the student toward his point of view of arbitrary basis vectors. On the other hand, the development of the relevant techniques of the tensor calculus in terms of an arbitrary basis in two dimensions lays the foundation for a very rapid generalization to Riemannian spaces of n dimensions.

The mathematical development is largely heuristic and intuitive because the author believes that formal mathematical language would prevent the reader from grasping the main ideas. Occasionally this leads him astray, as, for example, in his conclusion (p. 15) that both mathematically and intuitively it is "trivial" that three differential equations of the first order in three unknown functions have a solution, even though the equations in question are quadratic in the derivatives.

There are exercises at the end of each chapter, and a bibliography of 21 items for further study.

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Reprints

Aerodynamics: A Space-Age Survey. John E. Allen. Harper and Row, New York, 1966. 128 pp. Illus. Paper, $1.25. Reprint, 1963 edition.

The Architecture of Matter. Stephen Toulmin and June Goodfield. Harper and Row, New York, 1966. 398 pp. Illus. Paper, $2.45. Reprint, 1962 edition.

Atomic Physics: An Atomic Description of Physical Phenomena. Gaylord P. Harnwell and William E. Stephens. Dover, New York, 1966. 413 pp. Illus. Paper, $2.50. Reprint, 1955 edition.

The California Condor. Carl B. Koford. Dover, New York, 1966. 168 pp. Illus. Paper, $2. Reprint, 1953 edition.

The Concepts and Theories of Modern Physics. J. B. Stallo. Percy W. Bridgman, Ed. Harvard Univ. Press, Cambridge, Mass., 1966. 355 pp. Paper, $1.95. Reprint, 1960 edition.

Day of Trinity. Lansing Lamont. New American Library, New York, 1966. 254 pp. Illus. Paper, 75¢. Reprint, 1965 edition.

The Discovery of Time. Stephen Toulmin and June Goodfield. Harper and Row, New York, 1966. 280 pp. Illus. Paper, $1.95. Reprint, 1965 edition.

The Evolution of Life. Everett C. Olson. New American Library, New York, 1966. 302 pp. Illus. Paper, 75¢. Reprint, 1965 edition.

Extraterrestrial Life: An Anthology and Bibliography. Report of a study held under the auspices of the Space Science Board, Natl. Acad. of Sciences–Natl. Research Council. Compiled by Elie A. Shneour and Eric A. Ottesen. NAS–NRC, Washington, D.C., 1966. 486 pp. Illus. $6. Thirty-four papers reprinted from various journals and published between 1945 and 1965.

Infinite Matrices and Sequence Spaces. Richard G. Cooke. Dover, New York,

(Continued on page 1306)