

are occasionally mentioned. For example, the chapter on muscles contains sections on classification of muscles, embryonic origin, histogenesis, muscle contraction, skeletal muscle, muscle terminology, primitive musculature plan, fate of myotomic muscles, pharyngeal myotomes, fate of bronchiomeric muscles, derivatives of gill bar muscles, appendicular muscles, integumentary muscles, and electric organs.

I have mixed feelings about this book. Although I appreciate the need for such a united discipline, this "tasting" a little bit of everything left me with the distinct feeling of having "eaten" nothing. Areas such as physiology are covered more thoroughly in many general biology textbooks. The student at least can read about the more experimental aspects by finding the suggested readings in *Scientific American*, reviews, and technical papers. Certainly the major emphasis is on comparative morphogenesis. Here the author introduces the student to a large number of diverse examples of developing systems. And *this* is important, even to the molecular biologist looking for the best organism to investigate a specific problem in biochemical differentiation.

Bill D. Davis
Rutgers University
New Brunswick, N.J.

THE YEAR OF THE BUTTERFLY, by George Ordish. 1975. Charles Scribner's Sons (597 Fifth Ave., New York 10017). 148 p. \$8.95 hardback.

The saga of two monarch butterflies—from egg to caterpillar to mating adults and over a 6,000-mile migration, including the attempted return journey home—is related in scholarly detail in this book. Ordish, an economic entomologist, launches Pliable and Timorous (female and male characters from Bunyan's *Pilgrim's Progress*) on their lepidopteron adventure by describing their activities on emerging from their minute (20/1,000 inch diameter) eggs laid in a milkweed patch beside a filling station in Glens Falls, N.Y.

From that point on the story unfolds in abundant biological detail, instar by instar, stage by stage. The drama is told occasionally from the perspective of the filling station operator's son and his entomologist companion, but mostly from the imagined viewpoint of Pliable and Timorous. There are adventures galore: the task, as recently emerged caterpillars, of remaining in contact with their specific food plant while enduring storms, resisting attack by predators, avoiding or fighting off parasitic flies, and ultimately the arduous migration to Mexico and back.

There is, for the general reader, a healthy and digestible dose of sound biology throughout this book. Ordish frequently interjects informative tidbits that exemplify and amplify basic behavioral adaptations operative at the va-

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rious stages of the monarch's life cycle and several physiological and environmental factors that release the behavior.

Ordish is at his best when he temporarily strays from his story-line butterfly personalities and attends to the biological business at hand; for instance, the passage dealing with the monarch's abilities to navigate vast distances over water and varied terrain is excellent. But some readers will want more information on the significance and techniques of tagging butterflies. The fact that they can be tagged at all will surprise many.

Any beginning student of butterfly behavior will benefit by reading this attractive little book. Unfortunately, however, the more serious student is likely to object to the numerous cases of anthropomorphism and teleology, both of which are difficult to avoid in a narrative of this sort. Sample instances: At the outset we are told that the "... animals are the enemies of plants. They eat them. Plants fight back." "Enemy" is used all too frequently and interchangeably with "predator." We are told that *Exorista* (a parasitic fly whose grub bores into caterpillars and feeds on them) "... would feed extremely carefully, to avoid killing its host prematurely." Ordish himself warns of the pitfalls of anthropomorphism in nature writing and even includes a brief

essay about it in the appendix, although he fails to come to grips with the subject critically. The effect of anthropomorphism is, of course, to make the reader identify with the nonhuman animal cast in a "hero" role. More sound science might have gotten across had the reader been made to identify with the two young researchers who so methodically traced the four-month activities of Pliable and Timorous. After all, it is the human perspective from which we must inevitably view the world. Until we achieve the skill—i.e., scientific observation and objective description—required to observe that world dispassionately we surely are to be misled, and to mislead, if we attempt to describe the world from the perspective of a nonhuman animal to which we attribute human passions.

As appendix items, the book includes reference notes, a chronology of the life history of both butterflies under study, a brief glossary, bibliography, and index. Typographically attractive, the book would have been improved significantly by including informative photographs, and diagrams by a skilled entomological illustrator. The nine major drawings are poorly done and tend to be more decorative than informative; in three cases they are at odds with the text. More attention to illustrations, which would have justified the high price of this book, and diligent editing to avoid anthropomorphisms would have gone a long way to make this good book emerge into an excellent one.

Roy A. Gallant
University of Maine
Farmington

Books Received

- THE MANAGEMENT OF 35mm MEDICAL SLIDES, by Alfred Strohle. 1975. United Business Publications, Inc., New York. 128 p. \$11.00.
- THE EARTH AND ITS MATERIALS, by Constantine Constant. 1975. Richards Rosen Press, New York. 85 p. \$4.80.
- HOW TO MAKE YOUR SCIENCE PROJECT SCIENTIFIC, by Thomas Moorman. 1974. Atheneum Publishers, New York. 94 p. \$5.50.
- ECOLOGY, by Jeanne Bendick. 1975. Franklin Watts, Inc., New York. 72 p. \$4.90.
- FAT AND SKINNY, by Philip Balestrino. 1975. Thomas Y. Crowell Co., New York. 33 p. \$4.50.
- OIL: THE BURIED TREASURE, by Roma Gans. 1975. Thomas Y. Crowell Co., New York. 33 p. \$4.50.
- OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES, by the Oil and Special Materials Control Division of the Office of Water Program Operations. 1975. U.S. Environmental Protection Agency. 29 p. Price not given.