insect flight in 44 short chapters that describe basic structure, flight patterns, mechanics and chemistry of flight, flight instrumentation, and so on. Here and there the author takes a brief detour into some tangential area. His chapter entitled "Watching Insects for Pleasure" quotes several famous naturalists, whose descriptions of insect behavior border on poetry. One chapter explains how a fly lands on the ceiling. Another tells of migratory flights of locusts, butterflies, and other insects.

This is hardly a book for general reading by high-school students. It is more appropriate for the graduate student in biophysics. The author states that he is hoping to "convey to the reader the joy of discovery that comes to research workers." To do this, he describes some exquisitely delicate techniques used for the experimental study of flight. It is highly unlikely that any high-school pupil can find a science project here. The techniques are too difficult, the equipment too cumbersome and too costly. For example, the author assembled $30,000 worth of equipment to study muscle contraction in a 10-cent grasshopper. Then he used several hours of time at the $5,000,000 computer center to analyze the data. In another experiment a blowfly was attached to a special suspension that allowed free movement. (How light and delicate those joints and swivels must be!) The apparatus was placed in a miniature wind tunnel where the fly could be photographed at 8,000 frames per second. When the film was later projected at 2 frames per second, the author was able to determine the rate of wing action as well as the manner in which the wings operated during various maneuvers.

Some of the photographs are reproduced in the book as black-and-white enlargements. The sharp, clear, and instructive pictures of various insects in mid-flight are probably the highlight of the book. Unfortunately, the captions are often long and complicated. They are set in such tiny type that great concentration is required to read them. Worse still, in many cases the caption is printed on the obverse of the photo. This makes it impossible to look at the picture and read the caption at the same time. In fact, the entire book was set in type that is just a trifle small for the aging eyes of this reviewer.

Type size aside, the book leaves the reader with a sense of awe. Can a tiny insect really be such a complex flying machine? Can nature be so inventive as to produce flying mechanisms which satisfy all the basic principles of aerodynamics?

If science is a way of looking at nature, then the author has given us a peek at one tiny corner. The reader must be left with a feeling of wonderment at what he saw in that small glimpse.

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For Young Readers

THE GUPPY: ITS LIFE CYCLE, by William White, Jr. 1974. Sterling Publishing Co., New York. 64 p. $5.95 hardback.

This book, for the most part, reads easily. The author starts with an interesting history of the guppy and its name, followed by general fish body plan, feeding preferences, environmental tolerances, reproductive cycle, and a few behavioral characteristics. There are three pen diagrams which clearly represent the information. However, the color photography, which no doubt contributes to the high cost of this small book, is often so poorly focused as to obscure the reason for its presence, especially for a y unger reader. In many cases, high-quality black-and-white film could have conveyed the ideas at a much lower cost.

The author does explain vocabulary as it is introduced; thus, this book could be used by interested guppy-raisers at the 4th-grade level and up with complete understanding. In a few cases, information seems to be randomly included in an illogical sequence, as, for example, on page 57, where sex differentiation is mentioned in the same paragraph with guppy preferences in natural and commercial food.

Another major drawback is that, while the book is offered in a "science" series and seems to be adequate for describing general guppy characteristics and life cycle, it includes no bibliography or resource material to encourage and enable the reader to find additional pertinent literature.

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Games and Simulations

THE DEAD RIVER, by E. Nelson Swinerton. 1973. Union Printing Co. Athens, Ohio. $8.00 per game.

This simulation game attempts to teach students that "restoration and enhancement of our waters hinge on coordinated control and management. Each player becomes a member of a team of public or private officials. Together they must set up efficient programs to eliminate, reduce, or prevent pollution of an interstate waterway and improve its condition." There have been other games focusing entirely on our aquatic resources, and there are elements of river and lake restoration in a multitude of other games. This one stresses that no one individual or even a small group of individuals can handle a problem as complex as cleaning up a stream which flows through several municipalities. Cleanup requires the work of many agencies. That's a noble lesson to be learned, but this game is not likely to teach it.

The Dead River begins with a public hearing of the "Interstate Water Pollution Control Commission" which sets the stage for the problem. The hearing consists of six very densely written pages. The instructor's guide that accompanies the game suggests that the students read or role play the "hearings." In trying this game out with a group of students, I found that if we had role-played some of the characters at the hearing, perhaps they would not have fallen asleep. The most important piece of any game should be the instructor's guide, but, in this case, it appears to have been an afterthought.

After exercise I, the participants are told to stop and then there are no directions as to what the role of the moderator is to be. I assumed that there is to be a discussion period, but there are no suggested questions. Students are then divided into teams representing the "Valley Recreational Development Association," the "State Eco-Action Agency," the "Tax Payers Association," regional industry, and a federal environmental policy agency. Each team is to select an objective from the five listed. These objectives define what activities the river should support after the expenditure of between 1 and 5 million dollars to clean it up. Each team is to consider how it might raise the money to reach the chosen objective. The players are supposed to be able to determine how many people are providing fiscal support from the group's profile statement, but the profile statement is quite sketchy. Another major flaw in the game is that players are told that they can raise money by taxing hotels, restaurants, and tourist business or by increasing charges to tourists and residents 15 percent, but they are not told the size of the population.

Later, the players are asked to make a cost profile analysis, the objective being to analyze cost vs. benefits. Both the graph and the instructions are ineffective. After this, the various agencies are to defend why they chose the original objective, and then the various agencies are to negotiate for agreement on one common objective. These negotiations can generate some spirited conversation. Finally, they are asked to discuss with other teams their contribution to the clean-up program and whether or not the other teams' fiscal support is adequate. These are two points in the game where some good vigorous discussion can be heard.

The game claims to be for people from age 14 to adults. I find it very difficult to believe that a 14-year-old would be interested in some of the concepts taught in this program, and I am sure that the reading assignments are far above the reading level of most 14-year-olds. Unless some of these very serious shortcomings are tended to, this game, like the river it describes, will soon be dead.

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Books Received

THE GREAT WHALES, by Faith McNulty. 2nd ed., 1974. Doubleday & Co., New York. 100 p. $4.95 hardback.

CANCER IN CHILDHOOD, ed. by John O. Godden. 1973. Plenum Press, New York. 249 p. $19.50 hardback.

BEYOND THE KNOWN UNIVERSE: FROM DWARF STARS TO QUASARS, by I. M. Levitt. 1974. Viking Press, New York. 131 p. $10.00 hardback.

CELLS, ORGANS, AND ANIMALS, by J. A. Sharp. 1973. Blackwell Scientific Publications, London. 126 p. $7.50 softback.

ELEMENTS OF MARINE ECOLOGY, by R. V. Tait and R. S. DeSanto. 2nd ed., 1972. Butterworth & Co., London. 327 p. $12.80 hardback.

THE COMEDY OF SURVIVAL: STUDIES IN LITERARY ECOLOGY, by Joseph W. Meeker. 1974. Charles Scribner's Sons, New York. 238 p. $8.95 hardback.

PLANTS, ANIMALS AND MAN. Proceedings of the 28th annual meeting of the Soil Conservation Society of America. 1973. 272 p. $5.00 softback.

COURS ET DOCUMENTS DE BIOLOGIE, vol. 7, by E. E. Baulieu. 1974. Gordon & Breach, New York. 150 p. $16.25 hardback.

PATAGONIA: WINDSWEPT LAND OF THE SOUTH, by Roger Perry. 1974. Dodd, Mead & Company, Inc., New York. 127 p. $4.95 hardback.

SYNTHETIC PRODUCTION AND UTILIZATION OF AMINO ACIDS, ed by T. Kaneko, Y. Izumi, I. Chibata, and T. Itoh. 1974. John Wiley & Sons, Inc., New York. 312 p. $22.50 hardback.

SCIENCE AND ANTI-SCIENCE, by Morris Goran. 1974. Ann Arbor Science Publishers, Inc., Ann Arbor, Mich. 139 p. $10.00 hardback.

PLASTICS, by James and Lynn Hahn. 1974. Franklin Watts, Inc., New York. 65 p. $3.45 hardback.

UNDERSEA BASE, by Mae Freeman. 1974. Franklin Watts, Inc., New York. 64 p. $4.95 hardback.

HEAT AND TEMPERATURE, by Jeanne Bendick. 1974. Franklin Watts, Inc., New York. 72 p. $4.33 hardback.

FLOWERS AND PLANTS: AN INTERNATIONAL LEXICON WITH BIOGRAPHICAL NOTES, by Robert Shosteck. 1974. Quadrangle/The New York Times Book Co., New York. 349 p. $9.95 hardback.

TRANSDUCERS FOR BIOMEDICAL MEASUREMENTS: PRINCIPLES AND APPLICATIONS, by Richard S. C. Cobbold. 1974. John Wiley & Sons, Inc., New York. 500 p. $22.50 hardback.

REPTILES AND AMPHIBIANS OF THE WEST, by Vinson Brown. 1974. Naturegraph, Inc. 79 p. $3.50 softback, $6.50 hardback.

CILIA AND FLAGELLA, ed. by M. A. Sleigh. 1974. Academic Press, London. 511 p. $26.00 hardback.

EPIGENETICS, by Søren Løvtrup. 1974. John Wiley & Sons, Inc., New York. 547 p. $42.50 hardback.

A STUDENT'S ATLAS OF FLOWERING PLANTS: SOME DICOTYLEDONS OF EASTERN NORTH AMERICA, by Carroll E. Wood, Jr. 1974. Harper & Row Publishers, New York. 122 p. $2.95 softback.

INDEX TO INSTRUCTIONAL MEDIA CATALOGS. 1974. R. R. Bowker Co., New York. 280 p. $19.50 hardback.