

for horticultural history and biography. Furthermore, the map of the Arnold Arboretum on the lining papers, showing the location of each tree, makes this book a guide to the arboretum, as well.

Horticulturists and botanists, amateur and professional, will enjoy reading this history of plant exploration. Concentrating as it does on expeditions to Japan and China in the last century, it whets the appetite for reading further about the fabulous plant explorations of the world.

Carolyn Dodson
University of New Mexico
General Library
Albuquerque, NM 87131

SCIENCE FAIR PROJECTS



Botany: 49 More Science Fair Projects. By Robert L. Bonnet and G. Daniel Keen. 1991. TAB Books (Blue Ridge Summit, PA 17294-0850). 144 pp. Paper \$9.95.

Like the earlier *Botany: 49 Science Fair Projects* by the same authors, this book provides science fair project ideas for grades six to nine. After a chapter on science fair project basics, there are chapters on propagation, photosynthesis, hydroponics, stimulation, transport, plant dispersal and fungi/simple plants, each with between 4 and 10 projects.

Although there are some interesting ideas for projects, many appear unlikely to work well, and there is no indication that the suggested projects have been successfully implemented. The book has many major flaws, including factual errors and unclear and incomplete explanations. Examples of errors include saying that iodine is an essential element for plants, that xylem carries waste and that plants exhibit hydrogen deficiency symptoms. A large part of the book is redundant since much material from the first volume is simply repeated here, errors included. If this book is used, be sure to verify the information by checking other references.

David R. Hershey
University of Maryland
College Park, MD 20742-5611

PLANT TAXONOMY



Plant Taxonomy: The Systematic Evaluation of Comparative Data. By Tod F. Stuessy. 1990. Columbia University Press (562 W. 113th St., New York, NY 10025). 514 pp., illustrated. Cloth \$60.

Plant taxonomy (or plant systematics, sometimes used synonymously although the terms are not strictly equivalent) is the field of study of the "theory of plant classification" and includes the methods and principles of classification. The field has undergone great changes in recent years, although classical plant taxonomy, in the mode of Carl Linnaeus, has been around for as long as scientific research has existed. Carl Linnaeus is the best known of the historic plant taxonomists, to whom many of us latter-day plant taxonomists or plant systematists can trace our lineage. Tod Stuessy is one to whom we practicing plant systematists look toward to produce excellent students who will carry on in the field by combining classical methods with modern techniques. In this book Stuessy has presented those subjects that teach his students to become knowledgeable practitioners of plant taxonomy.

Stuessy was an early proponent of the use of cladistics in systematics, but he also presents the two other approaches to biological classification: natural classification and phyletics, and phenetics. These, along with a general discussion of classification, make up the first part of the book, which deals with principles of taxonomy. The second part discusses the mechanics of dealing with taxonomic data derived from morphology, anatomy, embryology, palynology, cytology, genetics, chemistry, reproductive biology and ecology.

The volume includes many illustrations, an extensive bibliography and indexes to authors, taxa and subjects.

The author states in the preface, "This book is designed to introduce the upper-level undergraduate or beginning graduate student to the philosophical and theoretical aspects of plant taxonomy." The book would certainly be useful as a reference text to provide information about some of the classical and modern techniques of plant taxonomy. There are other books emphasizing identification and nomenclature that are available to the beginning undergraduate student in plant taxonomy, but this work provides a broader coverage of the field's theory and philosophy and the systematic techniques advanced students need.

Laurence E. Skog
Department of Botany, NHB-166
Smithsonian Institution
Washington, DC 20560

ANIMALS—NATURE



The Moon by Whale Light; and Other Adventures Among Bats, Penguins, Crocodilians, and Whales. By Diane A. Ackerman. 1991. Random House (New York, NY 10022). 249 pp. Cloth \$20.

We try to understand ourselves and our place in this world by looking at other creatures whose designs and behaviors are shaped and governed by the ineluctable evolutionary forces that determine our form and function. In studying how other animals cope with environmental challenges, we are constrained by the very senses and perceptions which restrict understanding to the parameters of our human dimensions. This is the conundrum that never quite allows closure to our questions, and piques our curiosity about all the peculiar characteristics of the past and present fantastic creatures of our world.

With unrepressed enthusiasm, Diane Ackerman tackles the task of observing, examining, researching, reminiscing and reporting on four different groups of animals—bats, crocodilians, whales and penguins. Attracted by the unknown and challenged to reach out and touch these exotic animals, this award-winning poet and nature writer reflects our very human and secret desire to possess, control and understand the seemingly inaccessible. Ravenous to apprehend the mental and physical nature of these vertebrates, she immerses herself in her study and reports her impressions with great feeling. Library research and the guidance of expert specialists season and modulate these associations into a very readable narrative.

In studying these animals, Ackerman yearns to see into their consciousness and uncover what and how they think. In searching for a window into the animals' minds, she primes all her senses to forge some sort of communication. Where these efforts prove elusive, she continues to seek other perceptual clues. Happily, her experiences with these animals reaffirm their uniqueness, but the message gained from this inaccessibility is that mysteries will continue to haunt and provoke the human observer.

Ackerman writes about little-known animals because of her fascination with life: "There is no animal that isn't fascinating if viewed up close and in detail." Each of the four chapters weaves facts with details of the author's encounters and impressions.

She joins research groups and engages in the daily activities of tracking and recording. With a flair for ignoring thick technical terminology, she blends everyday words into descriptively colorful contextual portraits. As you read, you will agree that bats are "shy and winsome creatures who have just had a bad press." Bats, otherwise known as chiropterans, are applauded as natural pesticides with amazing adaptations for navigating and feeding. While bats are rapidly being destroyed, these amazing hand-winged forms make up nearly a quarter of all the world's mammals; and for their size, they're the longest-lived mammal on earth.

Crocodylians are fondly introduced as "mesozoic leftovers." Lacking visible sex determining chromosomes, these "living relics" depend on physical temperature to set their sex; eggs developed at temperatures at or above 94 F produce males; those incubated at or below 86 F yield females. The word alligator is a derivative of the Spanish *el legarto*, meaning "the lizard."

In reading descriptive inserts in our biology textbook, my students were awed by the details explicitly stated in

the chapter on whales. The blue whale, noted as the largest animal ever to exist on earth, has a tongue of elephantine weight and a heart with a mass of several tons. "And though we picture whales wobbling with blubber to keep warm, a whale's real problem is staying cool." A killed whale can quickly become a "burnt whale" since the decaying animal generates so much heat that the energy can readily disintegrate its bones. The whales' songs have been captured on records, and the sound of its rhythms and rhymes enthrall the human listener. Although accessible to human auditory receptors, the messages in cetacean music continue to elude us. Senses are specific for the species; can humans transcend these barriers?

Penguins, those caricatured tuxedoed dwarfs, are called the most anthropomorphic of all animals since everyone identifies with them. Although penguins are flightless birds that comically waddle on land, "they do indeed fly." They fly through the water to feed or to escape predators. "Penguins are watertight and airtight and thought to have more feathers than any other bird."

This is a book that will please animal lovers from seventh grade on and intrigue general readers of all ages. It will trigger the imagination of the non-specialist and may convince a science-alienated population that, when probed sensibly by asking the right questions, biology, the discipline that deals with life, actually is the most exciting of studies. Pedantic biologists may mutter that the writing reeks of anthropomorphism, but the delighted fan will say this writer picks up on the pertinent and that her impressions and reactions craft the words into appealing paragraphs. It is Ackerman's humanistic approach that enriches this scientific story. We attempt to see our world in many ways, and these essays combine poetry and science, personality and facts, and individual world view with illusory reality. At a time when we cry for public awareness of science, we need more writers who can combine craftsmanship with words to make the public more conscious of the "secret" wonders of nature.

Rita Hoots
Yuba College
Woodland, CA 95695

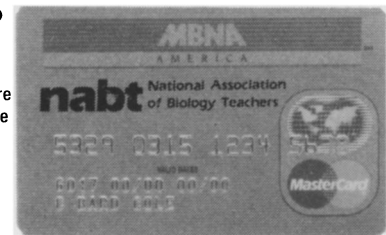
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