

Tetana and surviving a subarctic winter when the snow was over 10 feet deep. In the introduction to the book, Wendell Berry points out that some readers might object to the author's "anthropomorphizing of animal thoughts and feelings." Stanwell-Fletcher does allude to her bias here and discusses the balance between "scientific accuracy" and human interpretation.

Ms. Hubbell's essays take us on a journey into the world of a dozen invertebrates, some as common as the pill bug, and others elusive and unknown like the sea mouse, *Aphrodite aculeata*. She has done an exceptional job of gathering disparate and enticing information to provide the reader with the requisite information to feel friendliness toward each animal. Each chapter is not only an illumination of a particular invertebrate but explores its evolution, the role of geologic events, and the variety of attitudes and relationships humans have had and continue to have with the organism. She parallels the account of the organisms with a description of how biologists explore biology. When we learn about horseshoe crabs we also learn about punctuated equilibrium. The chapter about spiders includes a discussion of classification "systems" and cladograms. Every chapter includes an illustration of the topic invertebrates by Liddy Hubbell and ends with a list of cited references.

The combination of biology, adventure and personal stories these authors present makes the books appealing to a wide audience. For beginning students the books offer an introduction to exciting ways to exploring biology; for professional biologists they offer unique interpretations of our field.

These three books are welcome additions to our instructional offerings because students can be drawn into the subject through personal accounts.

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GENETICS

Chance's Choices. By Edward M. Kloza & Paula K. Haddow. 1997. Published by the Foundation for Blood Research (69 US Route One, PO Box 190, Scarborough, ME 04070-0190). 207 pages. Loose-leaf binder \$75.00 + \$6.00 s&h.



Chance's Choices is a set of human genetics modules that covers common disorders such as Huntington disease, cystic fibrosis, and breast cancer. The modules utilize a fictitious family, the Chance family, and the issues they face as they make decisions concerning their health.

Different family members tackle a variety of decisions including pre-natal screening, paternity testing, alcoholism and smoking. This is done in 12 "scenes" that can be used alone or combined. The scenes are designed for students to "offer their opinions, debate the issues, take sides in arguments and assume the positions of various characters (including the genetics service providers)" (p. i.). It is done in a soap opera style reflected in section titles such as "Will Alan ever play for the Celtics?" (p. 19) and "Deborah shares a secret" (p. 113). This set of modules is appropriate for

high school biology. Discussion questions, assessment suggestions, enrichment activities, writing activities, portfolio suggestions, guest speaker suggestions, overhead masters, a web site list, and a glossary are provided.

I was impressed with how a complicated procedure such as Southern blotting was explained in a clear and simple manner on an overhead master. This is an exciting unit designed to engage students in the practical applications of human genetics. Originally created in 1988, the authors have taken suggestions from teachers and improved and incorporated new up-to-date information into their second edition. Each scene has written instructions that walk the teacher step-by-step from when to use an overhead, to when to discuss a procedure. Factual information about the genetic disorder is given on the side of the page opposite the instructions. This makes reference material available to the teacher to answer most of the questions students might ask about a particular disorder. Family pedigrees are included with each scene. It would be easy to build the master pedigree with your students as you went through each module.

Chance's Choices is not only about genetic disorders; it is about people and their choices. I am looking forward to using it with my students next fall.

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ASSESSMENT

Assessing Science Understanding: A Human Constructivist View. Edited

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by Joel J. Mintzes, James H. Wandersee & Joseph D. Novak. 2000. Academic Press (525 B Street, Suite 1900, San Diego, CA 92101-4495). 386 pp. Hardback \$69.95.



Although the cognitive revolution led to the development of a number of instructional approaches designed to promote understanding, conceptual change, and meaningful learning, there is still a consensus opinion that science education is failing on many fronts. In a 1997 *Kappan* article Charles Anderson and Okhee Lee asked the question, "Will students take advantage of opportunities for meaningful science learning?" Anderson and Lee concluded that learners always retain control over their personal agendas and commitments, thus teachers must begin by understanding the learners and their goals. They further argued that "... the success of science teaching depends on creating social bonds in which the teacher and the curriculum lead the students to identify the goal of scientific understanding as their own personal goal" (p. 724).

The editors and contributors to **Assessing Science Understanding** would likely agree with Anderson and Lee on these points, but they would add that assessment is one of the critical factors that will encourage learners to accept the goal of scientific understanding as a personal goal. They argue that "... poor assessment practices in the elementary and secondary schools (and in colleges and universities) are clearly among the most significant impediments to *understanding and conceptual change*" (p. xix). They attribute the failure of cognitive methods to have the desired impact on achievement to the fact that changes in assessment have lagged behind changes in instruction resulting in a "... progressive decoupling (i.e. a "misalignment") of instruction and assessment in science education" (p. xx). With this volume, they seek to lay the groundwork for bringing assessment and instruction into alignment.

Assessment techniques addressed in this volume include concept maps, epistemological vee diagrams, interview protocols, image-based biology tests, observation rubrics, portfolios, SemNet software, written products, and multiple choice tests. It is difficult to imagine that a reflective teacher who is interested in improving one's practice would not find something of value in these pages. Additional chapters provide the theoretical rationale

for these methods or address issues in science education assessment such as the role of national and international testing, the psychometric issues involved in performance measures, and the limitations of paper and pencil tests.

A companion volume to **Assessing Science Understanding** edited by the same group provides a theoretical rationale and methods for **Teaching Science for Understanding** (1998, Academic Press). With these two volumes the editors intend to provide a strong theoretical basis for science education, linking theory to practice in ways that will contribute to the development of a science of science education. The intended audience for both **Assessing Science Understanding** and its companion volume includes science teachers, graduate students, teacher educators, curriculum developers, and researchers. Accordingly the chapters are written in a somewhat more informal style than one normally finds in a research article. However, these volumes are not step-by-step "how to" guides. The success of this project will depend on the extent to which the intended audience is willing to dig into the references, reflect on the lessons within the book, and also reflect on teaching practice as they experiment with ways to improve it. If these books, and others like them, have their intended impact, science education will have a bright future.

Anderson, C. W. & Lee, O. (1997). Will students take advantage of opportunities for meaningful science learning? *Phi Delta Kappan*, 78, 720-724.

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SYSTEMATICS & BIODIVERSITY

The Variety of Life: A Survey and a Celebration of all the Creatures that Have Ever Lived. By Colin Tudge. 2000. Oxford University Press (198 Madison Ave., New York, NY 10016-4314). 684 pp. Hardback \$45.



The field of taxonomy, or systematics, is currently undergoing rapid changes as cladistic theory, molecular biology, and new fossil discoveries reshape our understanding and interpretation of phylogenetic relationships. This book begins with a detailed review of the history of systematics, and provides an excellent update on the progress and contribu-

tions of cladistics to modern systematics. In this well-researched text, the author attempts to strike a balance between classical taxonomy and modern cladistics, a practical interpretation of the data that he names "Neolinnaean Impressionism."

The bulk of the text contains a survey of all creatures, flora and fauna, extant and extinct. Each major group is described with phylogenetic trees, illustrations, and detailed text. The mammalian taxonomy, my specialty area, was current and well-researched, as was the section on human evolution. The phylogenetic diagrams and descriptions included in the text would serve as useful supplements to standard zoology, botany and microbiology texts.

The book concludes with an impassioned plea for conservation of biodiversity in the face of rising human populations. The author focuses on the difficulties of surviving the next 500 to 1000 years, the proposed "demographic winter" for both humans and the creatures that share planet Earth. He emphasizes that both habitat conservation and captive breeding efforts will be required to save the maximum diversity of species.

The author provides clear and compelling arguments for retaining a central focus on the teaching of taxonomy in our biology courses. As we all know, the need to learn taxonomy is a very difficult "sell" to make to today's students, and I found his arguments so compelling that I have already used them to revise my taxonomy lecture notes.

The author clearly demonstrates his passion for the field of systematics as a tool to understanding the wonder of life in all its variety. He writes in a clear and engaging style. His explanation of cladistics, a complex subject with difficult terminology, is one of the best I've read in a long time. He reminds us that systematics is a dynamic and challenging field of scientific study.

This is a book printed in a refreshingly classic style that is easy on the eyes. The elegant sketches and two-tone illustrations are used effectively throughout the text. The taxonomic diagrams are clear and easy to understand.

I'd recommend this book for college-level biology teachers and for those of us, biologists and nonscientists alike, who simply wish to brush up on the latest progress in systematics. This classic book is a clear and cogent analysis of the current state of the field