

Feature Book Review

Forgotten Classic Holds Treasure for Today's Lab

Review of: *A Sourcebook for the Biological Sciences*, 3rd ed., by Evelyn Morholt and Paul Brandwein; 1986; 813 pp.; Harcourt Brace Jovanovich (Orlando, FL); ISBN 0-15-582852-5

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The breadth of topics that are covered in biology classes, whether in high school or introductory college courses, is vast. Few individuals, whether beginning or seasoned teachers, are content experts in such wide-ranging disciplines as molecular biology, plant physiology, and terrestrial ecology. Science teacher training tends to focus on pedagogy and classroom management, assuming content knowledge without providing resources to engage students in experimentation. The researcher or college professor, who is an expert in their particular field, may be uncomfortable teaching a general biology class to nonmajors or being part of an outreach program to teachers or precollege students. Designing and teaching lab courses that address such a diversity of disciplines can be a daunting, frustrating, and time-intensive experience. Conferences, workshops, and websites, journals, and other publications are standard sources of ideas and information, but the best sources are usually colleagues with a depth of discipline-specific background knowledge and a suite of tried-and-true lab explorations in hand.

In lieu of a personal advisory panel for lab development, *A Sourcebook for the Biological Sciences* is the next best thing! The third edition of the book spans the gamut of biological disciplines, was written by experienced educators, and provides detailed background information and clearly written step-by-step instructions for the preparation and execution of thoroughly tested demonstrations, experiments, and long-term projects. We have found it to be an invaluable resource for information and lab experiences used successfully in high school and college courses, as well as teacher professional development programs.

The first eight of the 10 chapters of *Sourcebook* present a comprehensive treatment of topics typically covered in general biology courses. Beginning with "The Structure and Physiology of Representative Animals and Plants," subsequent chapters include "Cells and Tissues," "Energy Utilization," "Building of the Organism," "Behavior and Coordination," "Development, Differentiation and Growth," and "Inheritance, Adaptation, and Evolution within Ecosys-

tems," and conclude with "The Biosphere." The *Sourcebook* is not designed to be a student manual — it is written specifically for the class instructor and/or laboratory preparation staff. Each chapter provides a framework for planning lessons that sequentially build upon each other and includes the scientific background for each experiment, along with the pertinent preparation instructions. A genuine virtue of *Sourcebook* is that it presents multiple experiments for the same concept, thus allowing the instructor to choose the experiments best suited to the class goals and available materials. Each chapter concludes with a useful selection of brief "Capsule Lessons" suggested as ways to "get started" on a topic but also useful as assessments.

For example, the fourth chapter, "Utilization of Materials: Building of the Organism" is thematically organized into three sections. "Transport of Materials in Plants and Animals" begins with an in-depth study of the mammalian circulatory system, which is then compared with the invertebrate system, followed by an exploration of blood cells and blood chemistry. Next, transport in animals is compared with that in plants, including transpiration and osmosis. The second section, "Energy Flow in Cells," provides more than 20 different experiments that examine glycolysis, cellular respiration, and fermentation, and an additional half a dozen that quantify oxygen absorption during respiration. The final section, "Respiration and Excretion in the Maintenance of Homeostasis," presents cellular respiration in the context of breathing and concludes with a study of kidneys. The "Capsule Lessons" that conclude the chapter include quick miniexplorations such as examining celery for fibrovascular bundles or the underside of leaves for stomata, as well as potential assessment questions that have the students explain the outcomes of hypothetical experiments based on their understanding of the circulatory system.

One of the most important questions that a student can ask an instructor is "How do you know?" When answered, either via teacher-guided student experimentation or through an interactive discussion, the process of science is

illustrated and reinforced. The materials that are included in *Sourcebook* provide the reader with the answers to a multitude of such questions. For example, each of the chemical tests for macromolecules that are included in the section on the biochemistry of cells contains a succinct discussion of the mechanism by which the tests yield positive reactions. As a second example, while blood typing is generally no longer performed in high school classrooms, *Sourcebook* includes a detailed background on the chemical basis and genetics of blood groups, always a point of interest with students that can be presented at multiple places in the curriculum — cells, body systems, or genetics.

The final two chapters of *Sourcebook* are exceptionally helpful references. Chapter 9 is a mini-instruction manual for maintaining and propagating organisms for classroom use. Although most teachers order living organisms from a biological supply house each year, teachers can use the easy recipes and instructions to maintain year-round cultures of *Paramecia*, *Amoeba*, small invertebrates, and plants for use at other times during the year or for extended explorations. Chapter 10 details a selection of useful techniques that include a host of recipes for chemical solutions and biological stains and how to construct assorted equipment and models.

The first edition of *Sourcebook* was written in 1958. Through two revisions, the authors have updated it with new scientific background, revised protocols as needed, and included new techniques as they became available. Because the last edition was published in 1986, most fields of biology have advanced a great deal so some of the information may be a bit outdated. However, even for rapidly changing fields such as molecular biology, the basics included in *Sourcebook*

are still correct. Nevertheless, readers may want to augment their own knowledge by consulting a more contemporary source. Safety information is provided to the standards of 1986, so consulting a current source of safety information is advised.

An advantage of *Sourcebook* having midtwentieth century roots is that it includes many classic experiments that have been forgotten or “lost” in the succeeding decades. The list of more than a dozen vital stains for use in observing various structures within protozoa and the photosynthesis and respiration experiments have been particularly useful in our teacher professional development program. The numerous drawings and photographs can easily be scanned for use as black-line masters or projected for use in the class or lab. If you’ve inherited chemicals or equipment in your lab or classroom whose original purposes are mysterious, *Sourcebook* can guide the reader on how to turn U-shaped tubes into simple manometers and provide several suggestions for experiments involving that bottle of bromocresol green.

With many schools fearing liability and risk, as well as lack of funds, supplies, and time, many science classrooms are abandoning investigation and substituting lecture and models. *Sourcebook* includes hundreds of tried-and-true experiments backed up by sound scientific background, detailed preparation protocols, and abundant illustrations. We have both found it to be an invaluable source of ideas, inspiration, and investigation that we have conducted successfully in our classrooms and labs. While sadly out of print, it is easily obtainable from used book websites. *Sourcebook* should be on every biology prep room shelf.