

amazingly comprehensive and up-to-date bibliography. But most importantly, there is a list of excellent leading questions for each unit.

This is a highly recommended work for the science teacher at any level who wishes to begin work on the problem of making his course relevant. Of course, those in teacher education have more of an obligation to look this over.

CORRESPONDENCE OF PASTEUR AND THUILLIER CONCERNING ANTHRAX AND SWINE FEVER VACCINATIONS, R. M. Frank and D. Wrotnoweka, Eds., xiii + 240 pp., \$7.50, University of Alabama Press, 1968.

There is far more interest and drama delineated in the letters of this volume than is communicated by the cumbersome title. These sixty-one letters and documents have never before been printed. After Pasteur's successful demonstration of his anthrax vaccine at Pouilly-le-Fort in June of 1881, he received numerous requests for his vaccine from throughout the world. However, as both the vaccine and the technique were in their infancy, he wished to control the production of vaccine in his own laboratory and make sure that it was properly administered. The correspondence in this book deals with two subsequent experiments, one in Hungary; the other in Germany by Pasteur's graduate student Louis Thuillier.

The correspondence tells us a lot about both men. They write as friends but always Thuillier is careful to address Pasteur as "Master." Thuillier comes through in his letters as a devoted scientist and disciple of Pasteur, but also as a human being. That Thuillier was selfless is indicated in a letter to a friend who had prepared a manuscript in which Thuillier was included, "I have just received your manuscript. I am returning it to you, with a great number of alterations . . . I would allow you to utter certain of the suppressed passages at my grave but never while I am living." Such modesty in our current scientific entrepreneurs would be most attractive.

Pasteur's instructions concern themselves mainly with the experimental method and the recording of data. He writes to Thuillier, "Make many notes, record everything you see. Find out as much as possible in order to be able to give us the fruit of your observations and knowledge." The book sheds light on inter-personal relationships as it communicates the latest scientific gossip of the time. At this time, Koch and Pasteur were at odds over matters microbiological. Thuillier communicates to Pasteur from Germany, "M. Koch is not liked by his colleagues. M. Struck is an intriguing ignoramus who has obtained his position as Director of the Reichsgesundheitsamt only because he is Bismarck's physician. He is very unpopular and his protégé, M. Koch,

shares some of the contempt in which his protector is held."

For those interested in the history of science, this heretofore unpublished material presents an interesting vignette of Pasteur and his times. However, for those who feel they are getting 225 pages of unrepentive text, there will be a disappointment. First of all, the book is reduced to half its content by having the original French on the left pages and the English translation on the right. While this may prove an interesting pony for someone studying for Ph.D. language examinations, it is likely to prove valuable to only a small fraction of those using the volume and certainly is expensive pedanticism. The contribution of the book is further reduced by a 60 page introduction that pre-capitulates the correspondence that follows, in many cases, word for word. The parallel French and the extensive preamble represent about the maximal inflation that can be applied to 74 printed pages of original correspondence.

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SCIENCE TEACHING AIDS

BIOLOGY AS INQUIRY, Voss and Brown, 239 pp., \$8.00, The C. V. Mosby Company, St. Louis, 1968.

The authors have made a strong attempt to move the thinking of the pre-service biology teacher from the role of the classroom authority to that of an inquirer with the students. They have broadened the definition of science to present the biological sciences as a human endeavor aimed at solving problems relating to living things, rather than a compendium of key phrases or a vocabulary list.

For far too many years those responsible for teaching the science methods courses have overlooked or refused to consider the contributions of educational psychology and social psychology to the teaching of science. A most important addition to *Biology As Inquiry* as a text of teaching methods for the biological sciences is Chapter 2, which deals with the psychological and sociological foundations for teaching biology. In this chapter the future teacher has an opportunity to consider such topics as student readiness, sex differences, levels of cognition, affective behaviors, transfer, motivation, and learning in the context of the science classroom. A major weakness of this section of the book is the limited consideration given to the role and importance of affective teacher behaviors as they relate to involving the students in the inquiry process.

Another chapter is devoted to the problems and importance of identifying and developing objectives for teaching the biological sciences. It is perhaps unfortunate that this chapter provides

the pre-service teacher with a listing of aims and objectives. Almost certainly, a number of science methods professors will in years to come require their pre-service teachers to memorize and regurgitate these lists of aims and objectives, rather than actively involve these pre-service teachers in the development of their own objectives concerning the teaching of science. The authors recognize, however, that most people involved in science education—from kindergarten through college—do not have a philosophical basis for what they attempt to do in their classes; too often the goals relate more to completing a text or syllabus than to producing a self-directed learner. Certainly the question asked by the authors, "Where are we going and why?", should be directed to all pre-service teachers.

Earlier chapters of the text seem far more useful to the prospective teacher than the later chapters. Those short sections that touch upon controversial issues (alcohol, narcotics, tobacco, evolution, and sex education) are very shallow treatments and should have been omitted or given far greater consideration. Several selected references could be substituted for Chapter 11, which deals with facilities and equipment for teaching biology; much of the material contained in this chapter was outdated before this text was published.

If it is possible to describe, in writing the teaching of biology through the inquiry process, this book is a success. If used with the proper related student activities demonstrating the inquiry process, *Biology As Inquiry* could provide a basis for an excellent science methods course.

H.G.

CREATIVE BIOLOGY TEACHING, Delma E. Harding, Roger P. Volker, and David L. Fagle, 342 pp., \$10.00, Iowa State University Press, Ames, Iowa, 1969.

Here is a jewel of a book which should be read by anyone who plans to teach biology, who is teaching biology, or who has taught biology, and anyone who is interested in dynamic teaching. Once read, it will be kept where it is easily available to be read again and again!

Although the authors tout the teaching of biology as an art (which it is), they demonstrate that it is also a dynamic profession—much more than just a job—and, while certainly no bed of academic roses, that it can be far more than a bed of thorns!

Beginning in Part I with a chapter on the *New Biology*, they deal with the "high RPM of biology," the interrelation of biology with other sciences (especially chemistry), and the need for innovative, thought provoking leadership in the teaching of biology. They progress in short chapters which deal with *The Teaching of Form and*

Function Together; Artistry in the Classroom; Personalized Teaching; and the Biologist in His Community.

Part 2 of the book concerns the environment which promotes creative biology teaching. There are cogent chapters on *Planning a Science Center*; and *Planning a Science Laboratory*. Both are superb!

Part 3 outlines how to go about *Selecting Useful Tools*. There are successive chapters on *Ways to Use Basic Materials; Planning Field Trips; and Shaping Biology Units*.

Part 4 is a series of Appendices, giving a wealth of useful information on *Teaching Aids; Working with Protists; Techniques Using Animals; Books, Magazines and Journals; Sources of Materials* (very useful and practical); and *Projects and Class Studies*. There is also a modest index.

Generally the authors have scrupulously avoided one of the pitfalls—being encyclopaedic—which they warn against in their suggestions on selecting (or writing) a textbook. If anything, they appear to be too brief—and the reader is left with the feeling of “tell me more, teacher!”

The book is wise, witty, informed, and informative, pithy, and encouraging (but discouraging where pertinent!). It makes use of many effective quotations from the wisdom of others to accentuate its points.

The book is simply, but attractively bound, with its title effectively and boldly displayed on the front cover and the spine, with otherwise little decoration—proclaiming it to be (as it is) a utilitarian book. The printing is in two easily read columns per page, newspaper-like, on high quality gloss paper. Chapter and section headings are in crisp bold-face print. There are numerous excellent sketches and photographs which add many thousands of exective unwritten words to the volume. You can't miss the page numbers at the upper outer corner, very bold, in 18 point type. The type face of the text is clear, readable, and large enough that even the tri-focalled may read it easily.

The book is written for the young teacher—especially for the teacher who wants to stay energetically young in his biology teaching. Hence it is a book for the modern age, for a teacher of any age.

I have only a few minor quarrels with the book. Whereas the chapters of Sections 1 through 4 in the main body of the text have good references at the end of each chapter for its amplification, The Appendices have reference lists which are all too brief. In Appendix A the list of “Leaders and Scientists Who Contributed to the Biological Sciences” overemphasizes contributions to the treatment of human ailments, and thereby denigrates the biologist *per se* while elevating unduly

the contributors from the area of medical research. There isn't an ecologist in the list, and modern taxonomy and systematics are virtually absent, as if they don't exist. Most of the scientists who have ever lived are alive and productive today, yet only a very few of them—mainly Nobel prize winners—are mentioned. Gravest of all, in a handbook for teachers, is the omission in the listing of any mention of the great teachers of biology, past or present. Some great writers of biology, who teach through their writings as well as in the classroom ought to be there; Julian Huxley, or Rachel Carson, or Loren Eisely are some who come to mind. The list seems to have been abstracted rather hastily from a few science history texts.

Another area in the book which needs prompt revision is the Appendix on *Using Protists in the Laboratory*. While generally good, the techniques for culturing protists are largely an out-of-date assemblage. Some modern, simple, and effective culture methods have been overlooked, as well as have some staining and preserving techniques, and some effective laboratory experiments.

These complaints are easily adjustable for the second edition—which the authors are (or should be) diligently preparing. This is a book which should and will grow through a series of editions—with the danger of becoming encyclopaedic.

I hope the authors continue to avoid that pitfall. They will better enjoy and profit from polishing the many facets of the diamond they have so expertly prepared and set.

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SCIENCE EDUCATION INFORMATION REPORT, GENERAL BIBLIOGRAPHY SERIES, No. 15, ACHIEVEMENT, 21 pp.; No. 17, SCIENCE AND SOCIETY, HISTORY OF SCIENCE EDUCATION, SCIENCE HISTORY, GENERAL STUDIES AND SURVEYS, 20 pp.; No. 18, LEGISLATIVE ACTS AND REPORTS, ADMINISTRATION AND SUPERVISION, SCIENCE FACILITIES, 10 pp.; No. 19, EVALUATION AND EDUCATIONAL OBJECTIVES, LEARNING THEORIES AND PROCESSES, RESEARCH AND METHODOLOGY, 43 pp.; December 1968; No. 20, TEACHER CHARACTERISTICS, STUDENT CHARACTERISTICS, 19 pp., January 1969, ERIC Information Analysis Center for Science Education, Columbus, Ohio.

Products of the ERIC operation at Ohio State University which specializes in information retrieval of science education materials. In each of these there is a clear exposition of the retrieval science's expertise and methodology. The objectives of such an operation are quite important indeed, and the benefits of it can be great.

However, this reviewer was frankly

disappointed in these publications. Most of the citations are from theses catalogued by University Microfilms of Ann Arbor and from *Science Education*. Some include citations from books and pamphlets. Of course, other periodicals are also included. This reviewer's disappointment was primarily because of what is not included and a deep suspicion of some of what is included. On the latter point, a career pamphlet is included under “Student Characteristics.” An inspection of it does not clear up the mystery of why it is included and not a host of other available pamphlets. On the first point, there are significant articles not included which are in journals such as *Science* and this one, and there are books omitted, especially under “Science and Society.” This leaves a nagging suspicion that a lot of editing out of articles was accomplished which inevitably must reflect the biases of the selectors or at best, the criteria of selections, whatever they may be.

This review is being written with great regret and perhaps out of ignorance; but these publications are simply not adequate for the titles they use.

PROJECTS: ZOOLOGY, Doreen Tampion, 294 pp., \$.75, Washington Square Press, New York, 1969.

A companion paperback to an earlier one on botany. It is extensive and includes a great variety of ideas for the teacher and student interested in this approach to learning. There is not much which is unfamiliar to most biology teachers. However, its strength is in the clear directions and the fact that it is all brought together under this heading. There are many dissection type projects and on animal behavior. Some caution should be noted which is not described in the book, and that is the requirement of sterility in those which involve living organisms, including man. For example, the blood sample experiment does not provide this caution.

For its price, this book can be purchased in multiple copies to good advantage for pre-college biology classes.

HEALTH RESEARCH LABORATORY DESIGN, U. S. Department of Health, Education and Welfare, National Institutes of Health, 83 pp., \$1.25, Superintendent of Documents, U. S. Government Printing Office, Washington, D.C., 1968.

A valuable booklet for all those in the business of designing biological laboratories. Although designed specifically for research installations, its value is also apparent for those interested in teaching. It is detailed yet succinct. Fully illustrated.

SCIENCE FOR BETTER LIVING, U.S. Department of Agriculture, 386 pp., \$3.00,