is an analysis of that conflict in the work of Linnaeus, with separate chapters devoted to, respectively, classes and orders, genera, species and varieties, and nomenclature.

The book includes an extended statement of conclusions, a bibliography, indices of citations in the principal works of Linnaeus and the writings of other workers, and a translation of *The Method of Carl von Linné, the Swede,* which is a broadside that first appeared in 1736. Adding to the general attractiveness of the book are six pages of halftones, including my personal favorite, the title page from *Hortus Cliffortianus* with W. T. Stearn's interpretation of the symbolism.

Reason and Experience is a rather difficult book, but it is at the same time quite readable and often captivating. The insights on the mental turmoil through which Linnaeus passed are valuable contributions to our understanding of the man and should enlarge our appreciation of his role in the shaping of traditional systematics.

The book is not intended as a major contribution to modern systematics; nevertheless it can be read with profit by all who have an interest in Linnaeus or the nature and magnitude of the forces to which he responded in his work. Readers interested in history and philosophy of science should find the book unusually attractive and useful.

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BIOLOGY IN THE NINETEENTH CENTURY, by William Coleman. 1971. John Wiley & Sons, New York. 187 p. $7.50 hardback, $3.95 softback.

Histories of broad fields of science (especially biology) have been little more than listings of names, dates, and discoveries. Because it avoids this difficulty remarkably well, the present work should be welcomed by historians and scientists alike. Coleman has written an interpretive and integrated history that covers a surprising amount of ground in few pages. He is necessarily selective, but he does examine thoroughly the main lines of thought during a period when biology was being transformed into a modern science. The function of this book (and of the series of which it is a part) is to provide an overview of the major trends in 19th-century scientific thought for nonspecialists, particularly teachers and college students.

Beginning with the introduction (in 1800, he says) of the term "biology" into natural philosophy, Coleman traces the professionalization of biology in the universities, research institutes, and natural-history museums. He finds two major themes in 19th-century biology: the search for (i) historical and (ii) functional explanations of living phenomena. These appear to Coleman to be distinct, and often mutually exclusive, concerns. He shows how these two modes of explanation permeated several crucial subdisciplines: cytology, embryology, evolution, physical anthropology, and general physiology. He shows how concern for functional explanations—especially a concern for experimental as opposed to descriptive work—came to dominate biology by the end of the century, eclipsing the prevailing historical mode of thought, which had reached its zenith in the work of Darwin. Altogether, Coleman is able to tie together many aspects of 19th-century biology that have often appeared to be disconnected and episodic.

The sections dealing with evolutionary doctrine and the science of man are outstanding. Here Coleman clearly delineates the connections among studies of species diversity, the Platonic doctrine of transformation, the rise of geology, the Darwinian revolution, and the growing awareness of man's place in nature—matters that formed the warp and woof of historistic biology during the 19th century. The chapter on man is a remarkable synthesis of much recent work in the history of anthropology as well as a preceptive reading of many of the older primary sources (Auguste Comte, Herbert Spencer, Émile Durkheim). By including this material Coleman has wisely expanded the customary definition of biology to include anthropology and sociology, which were seen by many 19th-century biologists as growing naturally out of evolution studies. Particularly important, in this treatment, is Coleman's attention to the strong links beween 19th-century biologic studies of man and the ideas of racism characteristic of western culture. He rightly shows the pseudoscientific basis of these ideas and exposes them for what they are: rationalizations of the white man's exploitation of his nonwhite brethren.

Biology in the Nineteenth Century is not without its faults. The type is much too small. Coleman's style is sometimes turgid or a little pedantic. Another fault is in consequence of trying to weave such a large fabric in so small a space: many names and scientific contributions are introduced for which full explanation, within the confines set, is not possible. However, the bibliographic essay at the end of the book is outstanding.

The book probably is best suited to

use in courses in European and American history and in the history of biology. It will not be easy reading for those lacking a background in history or biology, but it admirably synthesizes material for those who are knowledgeably drawn to the subject.

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Laboratory Manual

INVESTIGATIONS INTO BIOLOGY, by Robert W. Korn and Ellen J. Korn. 2nd ed., 1971. John Wiley & Sons, Inc., New York. 512 p. $5.95 (softback).

Preparing a laboratory manual that addresses both the knowledge and the process of biology is a difficult task. The authors have attempted it, and by stated intention the manual is weighted toward the process side ("experimental in nature"); but in fact the manual is little different from other manuals of prescribed directions for accumulating the knowledge of biology in the laboratory.

"To comply with suggestions that the first edition contained too much demonstration, we have incorporated more student work," the authors say. These changes are clearly evident in the second edition, but the decrease in demonstration is simply replaced by more fill-in-the-blank exercises. At no place in the manual does the student actually prepare data for presentation, nor does he ever really design his own experiment; rather, he places data in inadequately prepared tables and figures and follows directions for each step in the experiment. This is followed in every instance by several questions, and all too frequently each succeeding question reveals the answer to the previous one. Communication of experimental work receives scant treatment except in the appendix, with no reference to any style manual or basic format used by any journal. Some basic knowledge of statistics is presented in part I, but its use is extremely limited in the rest of the manual.

The information of biology has good basic coverage (chemical energy and biologic systems, the cell, growth and cellular differentiation, evolution, ecology, phylogeny, and the mammal as a product of evolution). But a great deal of this information probably could be presented better elsewhere (text, lecture, programs, etc.) and prior to the student's involvement in the experimental part of the manual. The manual needs more emphasis on the real problems in biology today rather than only on the ones we have already solved.

The authors have attempted to solve a difficult problem in their manual: what is the purpose of the laboratory in undergraduate instruction? This manual is a sort of answer, but it falls short of involving the student responsibly and creatively in the spirit of investigation.

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Physiology

LABORATORY EXPERIMENTS IN PHYSIOLOGY, by B. H. Levedahl, A. A. Barber, and A. Grinnell. 8th ed., 1971. C. V. Mosby Co., St. Louis. 183 p. $5.25 (hardback).

A more apt title would be "Exercises in Vertebrate Physiology": with the exception of the use of the insect eye, all of the material is vertebrate. Contemporary techniques in nerve, muscle, and endocrine studies are included among the 31 exercises. With the exception of using the frog skin to demonstrate transmembrane cation transport, the rest of the exercises—in digestion, physicochemical studies, circulation, and respiration and metabolism—have been standard for many years.

The book is easily read and is well illustrated. Clear directions for the preparation of animals and reagents and for the use of all the required equipment allow both the student and teacher to rely almost entirely on this manual for laboratory instruction. Either electrical transducers or kymographs can be used to perform the exercises devoted to muscle. An oscilloscope and an electronic stimulator are required for most of the nerve demonstrations. Human subjects are used frequently.

The book is aimed at college undergraduates but could be used in advanced-biology courses in secondary schools.

The book contains no hypotheses to be tested; that is, it is a collection of exercises rather than experiments. Perhaps the next edition will include a section on experimental design in relation to the investigative process—thus justifying its being called a collection of experiments.

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ELEMENTARY HUMAN PHYSIOLOGY, by A. B. Taylor, John S. Willis, and Mary F. Ruh. 4th ed., 1971. Burgess Publishing Co., Minneapolis. 125 p. $4.25 (softback).

The authors claim that this laboratory manual will give the beginning student in human physiology an idea of the scientific method, an insight into experimental physiology, and an opportunity to observe firsthand some of the important functional concepts in a

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