inclusion of a section on heteroaromatic reactivity is curious, since the section does not deal with a physical method at all, but with calculations of electron densities and localization energies. The chapter on x-ray diffraction, which is restricted essentially to the heterocycles present in nucleic acids, is so short that it is of limited value. Perhaps the most valuable chapters are those on ionization constants and polarography and potentiometry; numerous tables of data provide thorough coverage of the most important heterocyclic systems.

Volume 2, on spectroscopic methods, is an extremely well-done and worthwhile volume. Three really first-rate chapters—on infrared (Katritzky and A. P. Ambler), ultraviolet (S. F. Mason), and nuclear magnetic resonance spectroscopy (R. F. M. White)—constitute the bulk of the book. Each is systematic and thorough, with many tables of relevant data; these chapters are sure to make this volume a standby for the many chemists working on heterocyclic compounds. The sections on infrared and ultraviolet spectra in particular are characterized by high-level discussions of the fundamental origins of absoption bands, discussion that is rare in books on spectroscopy for nonexperts. The only error that I noted is an unfortunate mistake in the definition of tau in the chapter on nuclear magnetic resonance. A discussion, necessarily brief, of nuclear quadrupole resonance in heterocycles (E. A. C. Lucken) rounds out a volume that can be highly recommended, a book that every organic chemist would find worthwhile.

RICHARD K. HILL
Frick Chemical Laboratory,
Princeton University

Physiology

Physiological Measurements of Metabolic Functions in Man. C. Frank Consolazio, Robert E. Johnson, and Louis J. Pecora. McGraw-Hill, New York, 1963. x + 505 pp. Illus. $14.50.

In the preface this book is described as a compilation of procedures which have worked satisfactorily in the authors' laboratories. This means that the selection of material was not necessarily based on its physiological importance, and the scope of the book is thus limited.

I should have liked to find more about measuring isotope concentration, more about new types of gas analysis by gas chromatography, spectrometry, and heat conductivity, and a more thorough explanation of Pauling's magnetic oxymetry. On the other hand, several equations seem superfluous, and various passages could have been shortened—for example, the 5-page discussion of an article in which "Weir showed by computation that the energy expenditure can be approximated closely from only two measurements, the volume of the expired air and its oxygen content." This appears less formidable, if one remembers that several generations of physiologists have approximated energy expenditure from oxygen consumption alone and that even beyond the field of bioenergetics this simple estimate, which is based on "Thornton's rule," is still used.

The book seems to be written mainly for instructors who are engaged in training laboratory technicians. It contains very detailed checklists of the apparatus and materials necessary for each measurement described; even notes about where the listed items can be purchased and helpful hints on what pitfalls to avoid are included. But some trivialities, such as "be very careful," should have been avoided. The illustrations are very good. One shows various respiratory valves, whose air resistance is indicated in a plot and a table. The section on preparing anticoagulant solutions and their minimal concentration is bound to be especially useful.

The checklists for materials and the directions for the procedures do not seem to afford much leeway for the instructor's own ingenuity, but the book leaves a lot of opportunity for a teacher to explain principles, to evaluate methods, and especially to clarify the physiological meaning of results. Only rarely do the authors express their own opinions. One such exception is their question at the end of a 27-page chapter that involves nearly 100 references: "Is it possible to measure fitness performance and stress?" The question seems to remain open.

There are several slips that escaped editorial attention, among them, for example, an index given as the sum of a time, a frequency, and a concentration (p. 390) and this statement "If the weight factor had an unusually large volume of extra cellular water . . ." (p. 258). The first sentence on page 1, "The production of heat or energy" conflicts with the law of conservation of energy, which is mentioned on the same page, but could be made to agree with that law by the statement "heat or *other forms* of energy."

Because this book, which is rich in useful detailed information on physiological measurements, is intended as a teaching aid, it is especially important that semantics should be carefully considered.

MAX KLEIBER
Pacific Biomedical Research Center,
University of Hawaii

Francis Bacon

Francis Bacon and the Modern Dilemma. Loren Eiseley. University of Nebraska Press, Lincoln, 1962. vi + 98 pp. $3.

Loren Eiseley, anthropologist and interpreter of science, invokes the image of a great "statesman and strategist of science" of 400 years ago, Francis Bacon. With ardour and poetry Eiseley rekindles the importance of Bacon's thought and evokes its depth as well as its modern relevancy.

Bacon beheld a world "where the unexpected and coruscating illumination" constitutes our faith in reality, but where the mind of man, "by the help of art," can make "a match for the nature of things." He saw that it was man's destiny "to vex" nature, "not just to live in nature, but to create a new nature." Bacon was "a kind of lens . . . through which thought gathered, was reorganized, and radiated outward again in new forms."

Bacon, one of the first cultural relativists, understood the role of technology even before the tide of industrialization swept across the Western world. The differences of human conditions, he wrote, come "not from soil, not from climate, not from race, but from the arts." Lighting the torches of inductive thinking and empiricism, he drove back the shadows of medieval dogma, posing "a new set of questions to mankind."

At the same time, Bacon foretold the ambiguity of science, both for good and for mischief, and the need for reference to "the uses of life," for which science must be ever "an enlightened servant."

Eiseley, author of such prize-winning books as *Darwin's Century* (1958) and