Cicuta maculata, underground parts should certainly have been shown, but for most species the drawings, though somewhat uneven in quality, seem to be adequate for general recognition.

The greatest deficiency is the absence of range date. For Ontario and the area around the lower Great Lakes, where nearly all the species may occur, there should be less difficulty, but for New England this becomes a serious shortcoming. Some 22 of the species treated here reach only to western New York; 21 others extend east only to Vermont or Massachusetts, while 11 more are found only to New Hampshire.

The book is of convenient pocket size and should prove adaptable for use in making field identification. It will also be useful for quick recognition where details of flowers and fruits are not important.

A. R. HODGDON
Department of Botany, University of New Hampshire, Durham

On Teaching Biochemistry

How much biochemistry should we inflict on medical students? The question haunts everyone engaged in such teaching. The body of knowledge of this discipline has been increasing exponentially since the 1930's; the textbooks have been growing, and the medical students groaning, in proportion. It is no secret that most students resort to the use of "ponies" as guides through the maze of required information.

The authors of **Biochemistry** (Williams and Wilkins, Baltimore, 1965. 387 pp., $6.75), S. P. Datta and J. H. Ottaway, teach biochemistry at the universities of London and Edinburgh, and they have organized their lectures into a book which has gone through six editions under the title *Aids of Biochemistry*. *Biochemistry*, the current edition, is then apparently a pony grown to almost full size.

The organization of the book is traditional; it does not deviate from that found in books written 40 years ago: hydrogen ion concentration, chemistry of carbohydrates, chemistry and lipids, and so on. The student does not encounter anything dynamic until he reaches chapter 7 where enzymes are discussed. The authors cannot be blamed for this presentation; with respect to textbooks it is an almost universal heritage from the German school of biochemistry of some 60 years ago. For the first third or more of the course the student must endure a barrage of descriptive details of what is essentially the chemistry of natural products. He could be led much sooner into areas of biochemistry which may capture his imagination and which might make the memorizing of descriptive material more endurable. After all, one can teach all there is to know about enzymes if a student knows the structure of succinic and fumaric acids.

Another instance of the authors' overly strong ties with the past is their use of the meaningless term "detoxication" as a chapter title. However, to their credit, it should be noted that they promptly explain that no such process really exists. For, owing to advances in our knowledge of enzyme chemistry, it has bcoeme clear during the past three decades that what used to be called "detoxication" is simply the cumulative result of the lack of specificity of some enzymes. This teleologically rooted term should have been buried as soon as it became apparent that many "detoxication" products are more toxic than the starting material.

The book is very weak in the presentation of the impact of newer knowledge of genetics on biochemical thought. Nor is it free of serious errors. On page 81 the following statement is made: "Since the RNA which exists in the various subcellular fractions is probably heterogenous it is not surprising that there are wide variations in the estimates of its molecular weight; values between 20,000 and 2,000,000 have been found and liver sRNA probably has a molecular weight near 10,000." It would be difficult to devise a single sentence which would convey more misinformation about RNA.

The production of the book is dreadful. Small print is tightly packed on small pages. In the copy that I examined pages 281 to 316 are bound upside down and, consequently, in Hebraic order. How this blunder in the bindery escaped notice is beyond comprehension. I riffled the pages before the eyes of an intelligent 12-year-old child, and within a second she commenced the laughter of delight which she reserves for discoveries of "goofs" of the adult world.

It is difficult to see what purpose this book will serve. The need of medical students will not be fulfilled by more textbooks and more ponies. What is needed first is an agreement on the periphery of the area of the discipline to be covered. Such a delineation could come as a consensus from the teachers of biochemistry and the teachers of clinical subjects. Then a few well-written texts of reasonable size might present a coherent, current view of biochemistry which the medical student may receive with a sense of excitement.

ERNEST BOREK
Department of Biochemistry, College of Physicians and Surgeons, Columbia University

Metals and Gases

The author of **Thermodynamics and Phase Relations** (Academic Press, New York, 1965. 322 pp., $13) is J. D. Fast, chief metallurgist at the Philips Research Laboratories and professor at the Technical University of Eindhoven. The two-volume series, *Interaction of Metals and Gases*, of which *Thermodynamics and Phase Relations* is volume 1, is apparently aimed at undergraduates and practicing metallurgists. This first volume is complete in itself, well written, and indexed. The author's style is very readable (as in his book on entropy) and his 50-page introduction to thermodynamics is unusually lucid; one topic leads smoothly into the next, symbols are adequately explained, equations derived, and many practical examples given. There are no home problems. Pertinent references to the literature (up to 1964) are given in footnotes on nearly every page.

The section on thermodynamics and the calculations of equilibria precedes chapters that deal with reactions of pure metals and gases (silver-oxygen to tungsten-oxygen systems), reactions of alloys with gases, carbon and oxygen in steel, solutions of gases in metals (emphasizing hydrogen), and solutions of gases in alloys. The gases (hydrogen, oxygen, nitrogen, and carbon monoxide) and the metals discussed are those of practical metallurgical interest with occasional mention of exotic alloys used as getters.

It would not be fair to criticize omission of many systems and subjects —for example, heat capacity, rare gases, and similar topics—that have been omitted or treated too briefly; however, the omission of defect-theory [see Libowitz's excellent book *Solid*

State Chemistry of Binary Metal Hydrides (1963)] and the bare mention of surface adsorption, hysteresis and other important topics are serious flaws. Perhaps they are treated in the second volume, *Kinetics and Mechanisms*. In these times when chemistry, metallurgy, and solid state physics are converging on the problem of the nature of metals, it would be helpful to orient students towards this convergence by means of a few dozen pages written in the same clear style as the rest of this book.

The format, printing, and illustrations (which include several colored photomicrographs) are excellent, as is the translation (by M. E. Mulder-Woolcock). The book will probably enjoy wide use by metallurgists and metallurgy students because it contains a great deal of factual material, including many phase diagrams, and because it is lucid and concise.

T. R. P. GIBB, JR.
Department of Chemistry,
Tufts University

Biochemical Research

Biologically occurring quinones, particularly those related to ubiquinone, vitamin K, plastoquinone, and tocopherol, have recently assumed increasing interest in a variety of biochemical research areas—for example, in oxidative phosphorylation and electron transport, photosynthesis, and nutrition. This interest stems from the fact that these quinones are easily oxidized and reduced; they provide chemical models for oxidative phosphorylation, and they are present in practically all cells. However, in few cases have these properties been unequivocally related to a distinct biochemical process. As Crane writes, "we have quinones in larger amounts and in more places than we can explain on the basis of recognized electron transport function" (p. 183).

The publisher states that this book, **Biochemistry of Quinones** (Academic Press, New York, 1965. 603 pp., $18), edited by R. A. Morton, was "planned as a guide to the firmly established knowledge concerning methods of studying quinones and to recent advances in this increasingly important field of research." The first claim is well realized in an invaluable series of articles (by Morton, Pennock, Isler, and Langemann, and J. Green and McHale) on the chemistry and spectroscopic properties of the quinones. These articles represent the best current compendium of such data. The power of nuclear magnetic resonance spectroscopy (NMR) in deciding fine points of structure is especially evident. Some cross-references in these articles would have been helpful—for example, there is no mention in Pennock's discussion of NMR spectra that actual figures of such spectra appear in the review by Isler and Langemann, which Pennock's review precedes.

The publisher's claim with regard to recent advances in this area is much more difficult to realize, as it must be in all cases where research is moving rapidly and the publication lag is approximately 12 to 18 months. Recent developments have necessitated a complete reevaluation of some points raised by D. E. Green and Brierley. New advances in knowledge of biosynthetic pathways have also occurred.

In the section that deals with function, a novice might be unaware of some sins of omission concerning the work of groups other than the author's own. To the editor's credit, this seeming disadvantage is turned to an advantage by making it possible for various opinions to be expressed where areas of controversy exist. Although this approach has led to some overlap, it is of minor consequence compared to the benefit of having different points of view presented—for example, the following articles should be compared: the article by D. Green and Brierley with the one by Chance on the role of ubiquinone in electron transport; that by Hemming and Pennock with the one by J. Green and McHale on tocopherol relationships; that by Redfearn with the one by Crane and Arnon on plastoquinone function.

Glover's review on the biosynthesis of quinones is marred by some unfortunate printing and bibliographic errors—for example, on page 215 the formula of sodium bicarbonate is presented rather than sodium formate; on page 240 the reference to Olson and others, 1960, does not refer to formate incorporation as claimed. I noted other errors throughout the book.

The two articles, the one by Redfearn and that by Crane and Arnon, provide a modern picture of the role of pastoquinone in photosynthesis. Redfearn's concluding discussion is excellent. Brodie, in a scholarly article, marshalls impressive evidence showing that napthoquinones play a role in oxidative processes in *Mycobacterium phlei*. Clinical and nutritional studies on vitamin K are covered by Doisy and Matschiner and by Mitchell and Marrian. B. Chance provides an excellent review of the difficulties inherent in measuring and relating the rate of oxido-reduction of ubiquinone to the overall rate of electron transport in the respiratory chain. The discussion of the principles involved in building adequate instrumentation to attack this problem is exceedingly well done. Chance suggests that ubiquinone may play a significant role in reverse electron transport.

Reading this book leaves one with the impression that the whole research area is poised for a deeper biological understanding of the role of these universally occurring, highly reactive substances. Despite the shortcomings that I have noted, this book has in great measure fulfilled its aims, and all of those who are interested in quinones will undoubtedly refer to it frequently.

HARRY RUDNEY
Department of Biochemistry,
Western Reserve University,
Cleveland, Ohio

Cybernetics and Medicine

Complex regulatory mechanisms that operate at the cellular level, the organ level, and the organ systems level are subjects of a considerable amount of current biomedical research. The various regulatory mechanisms also must be interrelated in order to maintain the homeostasis of the entire organism. The study of these biological control systems and of the problems of synthesis and coordination of knowledge about these systems in health and disease is included in the subject of cybernetic medicine as it is presented by Aldo Masturzo, the author of this monograph, **Cybernetic Medicine** (Thomas, Springfield, Ill., 1965. 158 pp., $6.50). In addition Masturzo presents a short commentary on regulatory mechanisms that may be applied to the area of social medicine.

In the United States there is no general agreement among scientists about what the subject of cybernetics should include, and it is not likely that a student could obtain an advanced degree in "cybernetics." For similar reasons the subject of cybernetic medicine is illdefined, and perhaps it will remain so because current usage of the word cybernetics seems