current literature on the subject in its varied forms, journals, preprints, and private letters, including obscure papers by derelict authors, is absolute and amazing, and he has been very careful in tracking down the original sources of interesting ideas. The bibliography alone (about 30 pages of fine print) is a welcome contribution.

TULLIO REGGE
Institute for Advanced Study, Princeton, New Jersey

Hematology

Blood Clotting Enzymology. WALTER H. SEEGERS, Ed. Academic Press, New York, 1967. 640 pp., illus. $27.50.

When thrombin acts on fibrinogen, it splits off the amino-terminal portions of two of the three peptide chains. The amino acid sequence of these peptides liberated from a great number of different fibrinogens is now known. As one of the contributors to this book points out, the structure of these peptides reveals a phylogenetic relationship similar to the morphological taxonomy. These peptides represent only about 3 percent of the fibrinogen molecules, and many people are reluctant to use such a small portion of the amino acid sequence of a protein to establish phylogenetic relationships. To me the correspondence is so striking that I can hardly consider it to be accidental. I think that these peptides have an important physiological role and that this is the reason why evolution has left its mark on them.

As the title indicates, this book recognizes the importance of enzymology in the study of blood clotting. At least two of the dozen or so clotting factors are enzymes, thrombin (the clot-forming enzyme) and the clot-stabilizing enzyme, and there are indications that other clotting factors may also be enzymes. This book deals not only with the two known enzymes but with all the known clotting factors. The chapters cover such topics as the molecular characteristics of substances active in blood coagulation, the activation of prothrombin, the transformation of fibrinogen into fibrin, the immunochemistry of the clotting factors, antithrombin, platelets in hemostasis, irregular blood coagulation, and the ultrastructure of the fibrin clot. A discussion of the role of fibrin in the spread of tumors would have been welcome.

Of course, not all the topics could be treated with the same degree of sophistication. It is quite obvious to the reader that fibrinogen and its clotting are better understood than are other aspects of blood clotting, and in fact are in the forefront of protein and enzyme chemistry.

A large portion of the book deals with prothrombin and its conversion to thrombin. Prothrombin now appears to be a complex entity giving rise under various conditions to prethrombin, autoprothrombin C, autoprothrombin I_p and I_c, autoprothrombin II, and autoprothrombin III. As purer and purer prothrombin preparations become available, this complicated picture will probably be modified. As far as I can see at this stage, there is room for different interpretations to develop. The sequence of events depicted by the "cascade" or "waterfall" propositions (which are mentioned in chapter 1 only to be immediately discarded) is attractive, easy to grasp, easy to teach. One is inclined to believe with Keats that "Beauty is truth, truth beauty."

In spite of the determined efforts of the authors to present only well-established facts, occasionally some outmoded concepts come up. I was surprised to read that thrombin is also a "polymerase." The experiments refuting this are clear-cut (provided highly purified components are used). Experts in the various fields may find similar minor points to criticize.

The contributors have attempted to present their topics in such a manner as to profit the uninitiated as well as the expert. A lack of continuity among the chapters reflects more the state of the field than any lack of effort on the part of the authors and the editor, who are to be commended for having undertaken this work.

KOLOMON LAKI
National Institute of Arthritis and Metabolic Diseases, Bethesda, Maryland

Botanical Phenomena

Plant-Water Relationships. R. O. SLATYER. Academic Press, New York, 1967. 378 pp., illus. $16.50. Experimental Botany monographs.

This is the first book to be devoted largely to a biophysical description of plant-water relations. In contrast with other works on the subject, which deal with specific experiments describing ecological and physiological phenomena, this book begins from the other direction, with tools from supporting sciences, and illustrates their applicability with experimental evidence. Thus, it is written from the conceptual point of view and represents a unique and valuable contribution to the field.

Starting with a physicochemical chapter on the properties of water, the author continues with one on the ecological significance of water in the plant environment and then two chapters that are excellent summaries of the physics of soil water. The rest of the work deals specifically with interactions between water and plants, beginning with a chapter on terminology and measurement techniques. Here the author changes from the older terminology based on diffusion pressure to that based on chemical potentials. Although osmotic pressure is defined in terms of potentials in this chapter, it is the one questionable term which is retained in the rest of the book. I would have preferred the use of potential terminology throughout, for uniformity and because of the differences in definition of osmotic pressure in botany and in physical chemistry.

Chapter 6 describes cell water-uptake and permeability phenomena in terms of nonequilibrium thermodynamics. The presentation is quite clear, although the reader will probably need to consult the early work of Kedem and Katchalsky in order to appreciate the reasoning fully. Two chapters follow with a description of water flow through the soil-plant-atmosphere and include valuable insights into the effects of energy exchanges between the leaf and the environment. The author concludes with a concise chapter on the physiological significance of internal water deficits.

On the weaker side, more extensive coverage of the material in the last chapter would have been desirable. For example, there is only passing reference to the extensive literature on hormonal control of water uptake associated with growth and on the effects of water stress on protein metabolism. Missing from the book as a whole are descriptions of solute accumulation and translocation, which, though large subjects in themselves, might well deserve treatment here. The equations used in this account are accurate, and the symbology is clear. There are some typographical