will have to be taken into account, with special consideration of sport for the handicapped, now being studied by such experts as Sir Ludwig Guttmann, Hans Lorenzen, Max Halhuber, and Daniel Brunner.

Eventually, the writer of a book on exercise physiology will have to be able to take it for granted that his readers are acquainted with standard works on medical physiology and biophysics such as those by Ruch, Bard, and Sodeman, as well as with the extensive literature on coaching. Much of the material contained in Harold B. Falls's new and well-produced volume will be found relevant to such a treatise.

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Plant, Soil, and Atmosphere

Water Deficits and Plant Growth. T. T. KOZLOWSKI, Ed. Vol. 1, Development, Control, and Measurement (xiv + 394 pp., illus. $17.50). Vol. 2, Plant Water Consumption and Response (xiv + 336 pp., illus. $15). Academic Press, New York, 1968.

Knowledge of plants as a factor in water consumption and of water as a factor in plant growth and development has never been so important as in this age of ever-increasing demands for water conservation and higher crop yields. This two-volume treatise on plant-water relations provides a timely and authoritative reference for workers of many disciplines involved in the surging research activity of this field.

Fourteen prominent plant, soil, and atmospheric scientists from the United States and abroad contributed to this work. Volume 1 is devoted largely to discussions of the physical properties of water in plants and soils and of the physics and dynamics of water movement through the complex soil-plant-atmosphere continuum. Here the authors make use of basic principles of heat and mass transfer and the tools of mathematics to emphasize the conceptual point of view. The concepts generally are related well to plant structure and function and supported by pertinent literature and experimental evidence. In some places, however, the physical descriptions are terse, and many readers probably will find it necessary to consult other references for full comprehension and appreciation of the particular matter being discussed.

The continuing terminology problem of how best to describe the energy state of water in soil and plant systems is considered in detail by the late S. A. Taylor and touched on from time to time by other authors. While it is good to see the term "water potential," based on the thermodynamic concept of chemical potential, somewhat formally adopted for the entire treatise, there are some inconsistencies in its use by various authors and some unnecessary uses of the related, but less meaningful, diffusion pressure deficit terminology.

Included in volume 1 is a long and exceptionally fine chapter by H. H. Barrs on the determination of plant water deficits. Although some readers will question some of his views of thermocouple psychrometry for measuring leaf water potential, his discussions of various methods nevertheless provide useful guidelines, and, one hopes, will help standardize the methodology of the field.

Volume 2 is concerned with applied aspects of plant-water relations. Included is a chapter by P. W. Talboys on vascular wilt diseases, a unique contribution not found in earlier works devoted to plant-water relations. Otherwise, the volume is concerned with evapotranspiration from agricultural crops and forest stands and with physiological and growth responses of herbaceous and woody plants to water deficits. However, probably not more than 25 percent of the combined text of the two volumes is devoted to growth responses. Even though this is an improvement over existing texts on plant-water relations, one can validly question whether the entire work is properly titled.

The relatively small coverage given to the physiological role of water in plant growth unfortunately reflects the amount of past research on the subject. C. T. Gates in his excellent chapter on the effects of water deficits on the development and growth of herbaceous plants acknowledges that most research on plant-water relations has been devoted to the study of water movement into, through, and from plants, and he makes a strong plea for future emphasis on truly definitive analyses of the growth response to water deficits.

Indeed, this approach to plant-water relations research deserves increasing attention. Perhaps one of the most successful ways we can increase the water use and production efficiency of crops is by incorporating into the plant genetic makeup adaptive mechanisms for maintaining favorable rates and quality of growth under suboptimum water conditions. This can best be achieved by generating selection criteria from a better understanding of the biochemistry and physiology of water in growth and in water-deficit control mechanisms.

The authors of this treatise do not emphasize this point of view, but their contributions summarize existing knowledge and concepts of plant and soil water relations on which the wide range of workers charged with the responsibility of increasing water use and production efficiency can build. These contributions are important and useful additions to the field.

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Radiation Reactions

Energetics and Mechanisms in Radiation Biology. Proceedings of a NATO Advanced Study Institute, Portmeirion, Wales, 1967. GLYN O. PHILLIPS, Ed. Academic Press, New York, 1968. xviii + 530 pp., illus. $22.50.

Under the joint direction of G. O. Phillips and R. Mason, 36 radiation scientists gathered in Portmeirion, Wales, 1–11 April 1967, for an Institute sponsored by the North Atlantic Treaty Organization. Their subject: the fundamental physics and chemistry of radiobiology. Their intent: mutual education and enlightenment. Their contribution to radiation research: a large, well-produced volume consisting of 32 papers covering a gamut of topics from the production of elementary radiochemical species in water to radiation effects in living cells and tissues.

For the wider audience to whom this monograph is addressed, it should be noted straight away that more than 80 percent of the material concerns radiation physics and chemistry. Perhaps this is justified in view of the diverse nature of the radiation reactions involved even in homogeneous condensed matter, but it follows that the biological content is restricted with respect to topics and points of view. The Institute itself may have succeeded in developing a meaningful level of interdisciplinary communica-