ken by dynastic change, foreign invasion, or other unfavorable political factors. In Europe, on the other hand, where the social and ideological background was quite different, the making of clocks (and later watches) could readily develop into a mass enterprise. As Needham himself points out, " . . . clock-making in China seems never to have become a mass industry before the time of the Jesuits (as it did in 15th- and 16th-century Europe)."

We look forward with keen anticipation to the appearance of part 3 of volume 4 (on civil engineering and nautical technology), as well as the projected three later volumes.

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Periodic Phenomena

Biological Rhythm Research. A. Sollberger. Elsevier, New York, 1965. xx + 461 pp. Illus. $25.

During recent years research on biologic rhythms has grown in volume and scope. Thus, temporal biology and medicine have become interdisciplinary fields. The physical, mathematical, and engineering sciences have contributed significant techniques and theories that facilitate the quantification of biologic rhythms and, thereby, the endeavors directed toward an understanding of the temporal coordination of physiologic functions as a whole.

The book here reviewed, *Biologic Rhythm Research*, constitutes a general survey of research on periodic phenomena within the animate world. The accents of presentation are placed on theoretical considerations intended to pertain to problems of analysis and to questions revolving around the factors underlying biologic rhythms. The topics discussed include principles of physics and engineering applicable to periodicity, the mathematical and statistical treatment of cyclic functions, cybernetics, and models of biologic rhythms. Applied research on biologic periodicity is referred to in the last chapter. An extensive bibliography accompanies the text.

The material covered in this well-organized, single volume is enormous. The elements of theoretical considerations are presented in the form of an outline, which does not communicate enough information for a thorough understanding of the complexities on hand. The selection of the material included and discussed is somewhat subjective. The author refrains from critical discussion. Unfortunately, "synonyms" for specific terms are used in a confusing fashion. Oscillatory instability in servomechanisms is not necessarily a vicious circle (Fig 1.12d), a square wave-shape does not define an impulse (Fig 1.30a), nor is feedback energy generally supplied by an amplifier (Section 2.25).

A multidisciplinary approach to biologic rhythm research requires familiarity with the scientific background of a diversity of theories and methods, and it requires clarity in the interpretation of terminology contributed by the various disciplines. Omissions along this line contrast with the intention of the book "to offer comprehensive information on biologic rhythm research, but also to provide a basic understanding of future problems."

This diligent and laborious volume is not a textbook for students and researchers starting work on rhythmic functions. It is recommended to the critical specialist in the field as an outline that provides an extensive and most helpful bibliography.

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Comprehensive Botany Text

Strasburger's Textbook of Botany. Rewritten by Richard Harder, Walter Schumacher, Franz Firbas, and Dietrich von Denffer. Translated from the 28th German edition (Stuttgart, 1962) by Peter Bell and David Coombe. Longmans, Green, London, 1965. xviii + 846 pp. Illus. 84s.

Although the major divisions of this text are nearly the same as those of the previous English version, which was published 35 years ago, the content has been greatly improved. In Morphology, the first of four parts, highly diverse subject matter is loosely integrated under such topics as cell size, possible isomers of polypeptides, electron micrograph of a root-tip cell, crystals in cells, interspecific grafts in the alga *Acetabularia* showing the role of the nucleus in determining the morphogenesis of cap regions, mitosis, meiosis, fine structure of cell walls, characters of tissues, morphology and anatomy of the plant body, reproduction, evolution, and grades of morphological organization; in all, this part is ultimately subdivided into 78 subject headings. Within the last-named topic the telome theory is presented lucidly. Anatomical descriptions and gross and microscopic drawings of mature plant organs are dominant, but developmental sequences in the origins of leaf, root, and stem apex are also presented.

Physiology in this text covers not only water relations, mineral nutrition, carbon dioxide assimilation, respiration, protein metabolism, translocation, and secretion but also growth of cells and organs and the transport of growth substances. Movements in plants, influence of environmental factors on plant development, photoperiodism, and heredity are also placed here. The biochemistry of many metabolic steps in higher plants and more universal sequences such as the citric acid cycle are given fairly complete treatment. Osmotic relations are presented more from the biologic than from the physicochemical viewpoint. Auxins are given very brief treatment, and leaf abscission is not correlated with auxin gradients. Kinetin is only mentioned, and the actions of gibberellin are briefly reported in widely separated contexts. Cell, tissue, and organ cultures are not discussed; phytochrome is not treated in appropriate contexts, nor is it in the index.

In the part on systematics, a survey of every major plant group is attempted, resulting in scant coverage of most. A redeeming feature is the survey that follows each division. A more complete presentation of at least one representative within each subdivision would be useful; such a beginning was made with *Funaria*.

Obviously the fourth part of the book, Plant Geography, is again too inclusive. Its second subpart concerns plant communities and would fit better under the heading "Ecology," a word that is used only a few times. Largely ecological are the discussions of succession and the life forms of Raunkiaer (the latter is located in the first part).

A list of references is appended, but only by inference is it possible to correlate superscripts at chapter headings with literature lists that are heavily weighted with older monographs. Owing to its main headings and the index entries this book appears to be more conservative than it really is. True, many topics lack the dynamic or action-spectrum approach, but enough of the experimental bases are alluded