not be expected. The soil nutrient factor is deliberately excluded from discussion. Most of the articles begin with concise and informative literature reviews of the theoretical problems. The authors have not tried to simplify the application in practice, but have pointed out gaps, due mainly to a lack of adequate methods for physiological analyses, between climatology and biochemistry on the one hand and practical yield on the other. Any given article may contain little that is new to a specialist in its field; the book should be read by those who are interested in the whole problem of vegetable production. It is then a source of information for agronomists, plant physiologists, and experimental ecologists alike.

If anything is to be criticized it ought to be the meager treatment of protein production, which is considered only with respect to the rather specialized rice plant, with matters of more general importance taken up only by a discussant. On the credit side, it should be mentioned that although a conference report the book is not burdened by rhapsodic discussion minutes.

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Superior Designs

Strength of Biological Materials. HIROSHI YAMADA. F. Gaynor Evans, Ed. Williams and Wilkins, Baltimore, Md., 1970. x, 298 pp., illus. $22.50.

Yamada, in the introductory chapter of his book, makes two interesting statements: "A full understanding of the structure of human and animal bodies depends upon a knowledge of strength of biological materials. Engineers are greatly interested in the superior designs of the Creator in order to formulate ideas for the construction of machines." The first sentence describes the author's purpose in writing the book; the second describes the aspects of the book this reviewer has found most fascinating.

Strength of Biological Materials is a vast compilation of data in both graphical and tabular form (235 figures and 190 tables), measured by Yamada and his students over a period of 25 years and previously available only in the Japanese language. It is probably the largest and most complete collection of information on the strength and other mechanical properties of biological tissues available. Tests of properties such as tensile, compressive, bending, torsional, and impact strength, and expansion, bursting, tearing, cleavage, abrasion, shearing, crushing, and hardness, were conducted with fresh, unembalmed material and standard or specially modified engineering test equipment. The test material included locomotor, circulatory, respiratory, digestive, urogenital, and nervous system organs and tissues of humans, other mammals, birds, reptiles, amphibians, and fish. An especially valuable section describes the effects of age changes on the strength properties. A chapter on materials and test methods and a glossary of engineering terms make the book reasonably self-contained. The data appear to be of high quality, with careful attention given to statistical variation of test material.

Some intercomparisons of biological data from the book and their similarities and contrasts with conventional industrial materials have provided this reviewer and his colleagues with a number of hours of stimulating thought and discussion. Some typical examples follow: Among human tissues, hair is by far the strongest (ultimate tensile strength 19.7 kg/mm^2, comparable to that of rolled aluminum), a fact probably not surprising to anthropologists. The second strongest type of tissue is compact bone (such as femur), with an ultimate tensile strength of 10.9 kg/mm^2, almost the same, on a weight basis (specific strength), as that of mild steel. Surprisingly, bone has an elongation at rupture of only 1.4 percent compared to 25 percent in mild steel. Most of the soft tissues reported behaved as elastomers, such as rubber, becoming stiffer as they were stretched. But in contrast to rubber with its maximum elongation at rupture of hundreds of percent, the elongation at rupture of calcaneal tendon is only 9 percent. The biological necessity of small elongations in tendon is obvious, but the sophistication of a structure which exhibits such behavior is remarkable.

This book should be of significant value as a collection of data, but even more as a source of ideas for investigations by the "biological materials scientist."

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Atmospheric Economics

The Value of the Weather. W. J. MAUNDER. Methuen, London, 1970 (U.S. distributor, Barnes and Noble, New York). xxvi, 388 pp. + plates. Cloth, $12; paper, $6.50.

This book concentrates on an attempt to place a "value" on the atmosphere as a resource, or more specifically on such natural weather elements as rain, temperature, wind, and storms. It also considers the value of artificial modification, both intentional and inadvertent, the latter including air pollution and its effects, of weather and climate information, and of weather predictions.

The author's primary concern seems almost foolish, since the atmosphere is essential as a medium for life and thus must be assigned an infinite value which is not reduced by losses due to storms, frost, or other phenomena, or augmented by conditions favorable for crop growth or business activity. Insofar as the information he presents serves as a basis for decision-making through the use of weather and climate records, weather predictions, or weather modification procedures, however, the main body of the book contributes to answering the more reasonable questions, How valuable are the services provided by government weather bureaus and private meteorological consultants? and How much would their value be increased through the improvements planned under such programs as the World Weather Watch and the Global Atmospheric Research Program?

The book is largely a literature survey, reviewing studies of such matters as the loss of life and property from floods and hurricanes, the dependence of agricultural yield on precipitation, temperature, and sunshine, the economic benefits to airlines from artificial fog dispersal at airports, the relationships between weather and riots and weather and crime, and the effects of weather on health. Methods of studying these relationships are reviewed, including modeling of economic consequences of weather variations and the utilization of weather forecasting and weather modification. The results of some cost-benefit studies are presented; these show that the economic benefits from use of weather predictions depend strongly on the cost of protective measures, but may be very great.

Air pollution is referred to in sev-