

by various primitive races of the world, notably on the North American Continent, for inducing sterility, or temporary sterility, in mankind. At present practically nothing is known of the active principles of these plants or the manner in which they function. Some consider such plants might possibly be utilized, with proper control by the State, in curbing the too rapid increase in population that is now taking place in some countries, such as India. Parestu and fodder plants for the tropics and sub-tropics, particularly leguminous fodder plants, are another group to which special interest is attached. Books of reference on the economic plants of different parts of the world, outlining what is already known of the useful plants of the region concerned, are therefore very desirable at the present time.

In the new edition of the Williams's book the first part is devoted to lists of economic plants arranged in groups such as major and minor plantation crops, forest crops, the various food crops, cover and green-manure crops, fodder crops and grasses, medicinal plants, oil seeds, perfumes, etc. Other headings include: fibres, hat- and basket-making materials, windbreaks and protective hedges, shade trees. The ornamental plants are dealt with similarly. In the main part of the book the species concerned are dealt with alphabetically according to genera. For each species the family and common name or names are indicated, and the space devoted to each is dependent upon its importance. Cross-indexing of common names has obviated the need for a separate index. The book is well arranged and easy to use. It is almost double the size of the original edition.

## AWKWARD PROPERTIES OF MATTER

### Deformation and Flow in Biological Systems

Edited by Prof. A. Frey-Wyssling. Pp. xii+552. (Amsterdam: North-Holland Publishing Co., 1952.) 38 f.

A CRAFTSMAN knows by experience whether his materials are in the right condition for his work; and the technologist who sets out to replace this traditional skill by a mechanical process may well find himself at a loss for terms in which to describe, measure and specify the consistency of a clay, for example, or the stickiness of a glue. For the biologist the failure of his materials to conform to any classical pattern is often a source of serious difficulty when an attempt is made to interpret a biological function in physical terms.

The rheologist, in whose province these problems fall, may usefully attack them qualitatively by defining new criteria to replace others the meaning of which is obscured by everyday use: thus 'spinnbarkeit'—that property of a liquid which permits it to be drawn into coherent threads—has a specific meaning, while 'plasticity' is ambiguous. His quantitative problem consists in measuring the properties he has defined and relating them to more familiar physical concepts such as elasticity and viscosity; often modifying familiar equations by making their constants adjustable.

Both approaches are exemplified in this book—the first of a series on the rheology of natural and synthetic products. Containing as it does nine independent monographs, the book cannot set out a unified

view of the rheological problems encountered in biology; but some topics such as the flow of a real liquid through a real tube do recur in a number of contexts.

A. Frey-Wyssling is concerned with the mechanism by which latex is extruded from elastic-walled storage tubes when these are opened by cutting into the bark of the rubber tree. He concludes that this is a passive process because its time-course is the same as that predicted theoretically for passive extrusion from an elastic tube. Other problems of flow in elastic tubes, including the physiologically important case of pulsatile flow, are dealt with by J. J. Hermans. Both contributions intentionally neglect departures from classical behaviour.

The importance of these departures is well brought out in the monograph by L. E. Bayliss on the rheology of blood. Thus the apparent viscosity of blood flowing through a tube is a function of the rate of shear, of the diameter of the tube (after allowing for the effect of tube diameter on rate of shear) and to a small extent on the duration of the shear. It is thus very difficult to compare viscosity measurements made by different techniques. Some of the anomalies are consequent upon the fact that blood is a suspension and that the spatial distribution of plasma and cells is modified during flow by the influence of velocity gradients.

R. D. Preston criticizes the theory that water may be drawn to the tops of tall trees in columns which retain their coherence even when the local pressure is far below the vapour pressure of water. The early measurements of the tensile strength of water gave high values which, he concludes, are not valid under conditions existing in the xylem elements. Moreover, if a cut is made into the cambium, dye solutions are sucked in with a time-course consistent with the theory that the xylem vessels are actually filled with air at reduced pressure.

That a qualitative or semi-quantitative approach to rheological problems may lead to valuable results is illustrated by G. W. Scott Blair's paper on the rheology of secretions. Characteristic changes in the consistency of cervical fluid occur during the oestrous and menstrual cycles, so that comparatively simple tests may be used to determine the time of ovulation. W. Seifriz's long monograph on the rheological properties of protoplasm also contains many qualitative observations of great interest, but his interpretation of them is often uncritical. For example, Kamiya's discovery that myxomycetes may exert flow pressure with a regular cyclic recurrence, and that this cycle can be analysed into Fourier components, should scarcely be attributed to "interplay of rhythm and harmony" in protoplasm.

The remaining papers deal with the plasticizer theory of muscular function; the relation between mechanical properties and structure in plant cell walls; the production and circulation of cerebrospinal and intra-ocular fluid; and with the diffusion of solutes, including gases, in tissues. The book ends with a short report of the first International Colloquium on Rheological Problems in Biology, held at Lund in 1950.

Most of the contributions are of a very high standard, but each will be of interest mainly to the specialist, who may not care to buy a whole book in order to obtain the monograph that interests him. However, the book undoubtedly deserves a place in every library that has a biophysical section.

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