used. There was small reduction in loaf volume and the loaves were darker in color as compared with the loaves without the yeast or germs. The texture was not such as would be rated highest by any expert scorer, but all were attractive and had excellent flavors. It should be pointed out that every criterion of quality upon which commercial breads are judged, such as loaf volume, oven break, external and internal color, crumb, etc., represent fictitious standards having no relation whatever to nutritive value of the bread.

Bread is a low-cost food. It is a basic staple. Nothing more effective in safeguarding the nutritional status of the poor can be done then to encourage the making and consumption of bread of the highest possible nutritive value. It should be so nutritious that it can make good most of the deficiencies of any other foods included in a simple and monotonous diet. The inclusion of the ingredients recommended would go a long way toward accomplishing this objective. This can not be said of the presently promoted "enriched" bread.

Dr. Williams is correct in stating that I have ignored sociological, industrial and legal precedent in my recommendations concerning bread improvement. It has long been my belief that eventually industry must adjust itself in matters involving foods to the physiological needs of consumers. For this reason I have offered suggestions concerning what bread should be composed of with no other objective than to acquaint the public with facts which are supported by scientific investigations. Success in putting into effect such a bread program would seem to be no difficult undertaking, provided the plan has the support of scientific and industrial leaders whose primary interest is safeguarding the nutrition of the people.

E. V. McCOLLUM
THE JOHNS HOPKINS UNIVERSITY

ONE-PARENT PROGENY OF TUBIFICID WORMS

IN a five-years' study of the activities of tubificid worms (*Tubifex* and *Limnodrilus*) it is indicated that these hermaphroditic forms are apparently able to effect self-fertilization and to produce young. Supporting this statement are the results from nine one-worm cultures, each treated as follows:

(1) The worm was isolated shortly after birth, when about one week old. (2) Was placed in a shell vial with 0.5 cc or less of mud examined under ×20 (approximately) to make sure that no additional worms or their eggs were present. (3) Was fed weekly by adding autoclaved sewage solids, in suspension. (4) When young worms appeared, they were removed from the culture.

The worms become sexually mature in three or four months after birth. Six of the above one-worm cultures, now about seven months old, have to date (late March, 1945) produced 208 young. Another worm, isolated as above and now more than two years old, produced 19 young during its first year and 148 during its second year.

My first observation of the above phenomenon occurred on August 11, 1943.

WM. C. PURDY
CINCINNATI, OHIO

SCIENTIFIC BOOKS

RELATIVITY

The Meaning of Relativity. By ALBERT EINSTEIN. 135 pp. Princeton, N. J.: Princeton University Press. 1945. $2.00.

THE book is a reissue of a book first presented in lecture form at Princeton University in 1921, and published by Methuen and Company in Great Britain and by the Princeton University Press in the United States. In this edition an appendix extending the theory of relativity to the "Cosmologic Problem" is added. Attention is also called to other developments, among them the solution of the fundamental problem—so long delayed—in which the law of the "geodesic," which, in the classical treatment, is superposed upon the law of the field equations, is shown to be the analytical equivalent of the restriction placed upon the motions of the singularities by the fact that the equations are non-linear.

The main text is divided into four chapters—"Space and Time in Pre-Relativity Physics"—"The Theory of Special Relativity"—"The General Theory of Relativity"—"The General Theory of Relativity (Continued)."

The treatment follows what may be called normal lines and, coming from the "Father of Relativity," is naturally authoritative and interesting in approach. It is, moreover, concise and to the point.

As to how far the book fulfils the promise of its title is to some extent an open question. It is often characteristic of one outstanding in originality that the concepts which are real and which form the workable elements of his thinking are, to a considerable extent, individualistic. They are apt to be strong and occupy positions of very positive conviction. Indeed, is it not the strength of these convictions which provide the stimulus for discovery? Sometimes, how-

ever, the result is something which does not so readily appeal to the thoughtful reader; for in order to be in tune with the author he has to supplement the cold logic of mathematical formalism with a kind of faith in the meaningfulness of the concepts. It is necessary to adopt a reasonably sophisticated approach to understand the theory of relativity at all. Yet if one becomes too sophisticated, he is apt to become troubled by such things as clocks and scales as bases for the arguments and wonder how far he can postulate things about these mechanisms. He wonders in what sense the author is thinking of such a concept as an electric field, for example. Also, things often fail to get defined carefully in the elementary books because it is supposed that such sophistication is for the advanced books, and they never get defined in the advanced books because these books seem to be no place for such elementary matters of definition. So one arrives at a kind of community of procedure in which all "in the know" do the same thing, even though it is not always clear as to what is being done.

Of course, one may write his own charter of understanding, and say that scales and clocks are simply symbolic ways of recognizing that we have certain procedures for assigning numbers x, y, z and t to the events, these procedures involving in part measurements and in part calculations which are supposed to correct the measurements for light velocity and so forth, and that the result of all this is symbolized by the statement that the scales and clocks give such and such numbers for the events. If, however, the reader becomes too sophisticated in this matter, he will find that he will depart from the spirit of the author's intent, either because of the unexpressed meaning which it is intended to attach to the concepts, or because the author has purposely tried to avoid what appear to be complexities of exposition. If the reader persists in his heresies, he will become worried by the meanings to be attached to the behavior of clocks and scales when set in motion relatively to one another—even the Michelson and Morley experiment will lose some of its dignity, and he will become conscious of the need of certain other principles to preserve for his scales and clocks a respectable existence in the realms of logic.[1]

Then, in the matter of the general theory, many students of relativity may have squirmed at the apparent importance of "light" in the matter. Indeed, it is possible to regard the famous constant "c" as appearing in another way—a way more in harmony with the astronomical surroundings.[2] If one does this, however, he will find that many relativists will regard the procedure as almost of the nature of desecrating something very "holy."

A rather long discourse of this kind would be quite out of place in a review, particularly of a book by an author so eminent, were it not that the *meaning* of the word "Meaning" is involved. The purpose of this review is not so much to present a criticism in this matter as to emphasize the fact that, in seeking a *meaning* of an author's presentation, more is necessary than an understanding of the mathematics—more is necessary than an ability to reformulate the subject to one's own satisfaction. It is necessary to obtain as clear a picture as possible of the mental attitude of the author and of his various concepts, so that he may immediately know what is meant by such a statement as "From all of these considerations, space and time data have a physical real, and not a mere fictitious, significance" (page 29). Alas, to obtain such a picture is not easy. To each one of us the pictures in the mind are things of his own, and the values which he places on the various elements are things of his own making.

W. F. G. SWANN

BARTOL RESEARCH FOUNDATION
OF
THE FRANKLIN INSTITUTE,
SWARTHMORE, PA.

[1] Some of these matters are discussed in a paper by W. F. G. Swann, *Rev. Mod. Phys.*, 13: 197, 1941.

[2] See, for example, W. F. G. Swann, SCIENCE, 62: 145, 1925. Also *Rev. Mod. Phys.*, 2: 243, 1930.

WOOD CHEMISTRY

Wood Chemistry. Edited by LOUIS E. WISE, of The Institute of Paper Chemistry, Appleton, Wisconsin. A.C.S. Monograph Series No. 97. 900 pp. New York, N. Y.: Reinhold Publishing Corporation. June, 1944. $11.50.

THE general field of wood chemistry has expanded greatly in the last few years as wood has been called upon to fill an increasing role in the needs of our nation. The book, "Wood Chemistry," seeks to bring together the views of some of America's best-known specialists in the field. The book contains 25 chapters and seeks to give as complete a picture as possible of the properties and possibilities of wood as a chemical material.

Part I, "The Growth, Anatomy and Physical Properties of Wood," gives the reader a conception of wood as a complex material of plant origin. The functions of the various parts of the tree, how the tree grows and the differences between hardwoods and softwoods are described. A chapter on the physical properties of wood gives those properties that are of importance in the use of wood as an engineering material.

Part II, "Components and Chemistry of the Cell Wall," deals with the principal components of the cell