

The volume contains 303 illustrations of machinery in use in the various operations, but few of these, comparatively speaking, are of American origin. Some of the illustrations which are given in diagrammatical sections are of value to the student, whilst many, which are simply pictures, convey little or no information as regards working details. In a few cases only are the machines fully described in the text.

Forty-one pages are devoted to the dyeing of about twenty-five different materials, including leather, paper, furs, feathers, foodstuffs, etc. In this the author has made an attempt to cover a very wide field indeed, but, as stated in the preface, he has been able to give only "a brief survey of these interesting fields." Some of the information given should, nevertheless, be of value to workers.

In a short review such as this it is unfortunately impossible to discuss the contents of the volume more fully. The book certainly deserves the attention of those interested in the dyeing of textiles and other materials. The amount of information which it contains is very considerable, and it is, therefore, safe to assume that at least some parts of its contents will appeal to every reader.

J. HUEBNER.

Time and Space.

The Absolute Relations of Time and Space. By Dr. A. A. Robb. Pp. ix+80. (Cambridge: At the University Press, 1921.) 5s. net.

IN 1914 Dr. Robb published a work entitled "A Theory of Time and Space." Bearing in mind the circumstances of that year, it is not surprising to find that the book did not attract a notice commensurate either with the intrinsic importance of the subject or with the novelty of the views propounded in it. The short work bearing the above title is introductory to the larger work, and contains a concise statement of the main results embodied in it. The treatment is very different from that of Einstein. In Einstein's theory the emphasis is laid exclusively on the idea of the "relativity" of experience. Dr. Robb, on the other hand, postulates as the basis of his theory an *absolute* relation—namely, the relation of "before and after." Not only does this relation serve as a physical basis; it is also the foundation on which he builds a goodly structure—his purely geometrical theory of time, of which the theory of space forms a part.

In the first section, devoted to preliminary considerations, the author shows by simple illustrations the difficulty of giving precise meanings to

apparently simple concepts such as the equality of lengths, and makes clear the close interdependence of time and spatial measurement. The keystone of his work is to be found in his treatment of the problem of identifying the same instant of time at two distinct points of space. In Einstein's theory each observer carries his own local time, and events which are simultaneous to one observer are not necessarily so when compared by the local time of another. Rightly dissatisfied with this view, the author adopts the bold point of view contained in the statement that there is no identity of instants at different places at all. In his own words, "the present instant, properly speaking, does not extend beyond here." It follows, then, that the complete specification of an instant of time requires the use of four co-ordinates (x, y, z, t).

The author then develops, by means of a system of twenty-one postulates, his four-dimensional geometry of time, and this development is characterised not only by a high degree of originality—particularly evinced in his novel and striking concept of conical order—but also by much skill and insight. Elements of time forming a system characterised by conical order, the spatial aspect, explicitly introduced in postulate v., becomes a direct consequence of this order. Analytically, after co-ordinates have been introduced, the theory leads to Einstein's restricted relativity. The work is a most valuable and original contribution to a very abstruse and difficult subject. More satisfactorily grounded than Einstein's theory, its far-reaching results merit the closest study, not only from the physicist, but also from the geometer. To the latter, indeed, it makes a strong appeal, since, as the author points out, the simple asymmetric relation of "before and after" appears to have important advantages over the concept of "linearly between" which has hitherto been mainly used as a basis for systems of geometry.

J. F. T.

Our Bookshelf.

L'Alimentation et L'Elevage Rationnels du Bétail. (Opinions du Prof. A. Mallèvre.) By J. E. Lucas. Pp. 466+4. (Paris: Librairie Lefrançois, 1920.) 18 francs.

THE lives of most men of science are divided between teaching and research; he is indeed fortunate who can harmonise the duties. The late Prof. Alfred Mallèvre, whose premature death in 1916 deprived France of a brilliant teacher and keen investigator, seems often to have regretted that his professorial duties left but little leisure for research, and it is sad to read, in the eloquent notice of his career by M. Georges Wery pre-