whereby this fraudulent undercutting could be prevented.

(3) The researches on synthetic dyes have not engrossed the attention of continental chemists to the exclusion of the study of natural colouring matters, and the present monograph, well printed on paper of pre-War quality, is a good indication of the interest taken by Swiss chemists in the border-line science of biochemistry. The subjects dealt with include a summary of the methods employed in obtaining balsams and resins and in subjecting these materials to systematic decompositions. The appropriate methods of proximate analysis are also indicated. The larger section of the work is devoted to the identification and preparation of the most important vegetable colouring matters. The detailed information supplied on this abstruse subject is supplemented by many references to original memoirs, and there is an adequate index. The brochure is the eighty-fourth section of the comprehensive handbook of experimental methods in biology being issued under the editorship of Dr. Emil Abderhalden, the well-known physiologist.

Relativity Problems.

Sidelights on Relativity. By Prof. A. Einstein. I. Ether and Relativity. II. Geometry and Experience. Translated by Dr. G. B. Jeffery and Dr. W. Perrett. Pp. iv+56. (London: Methuen and Co., Ltd., 1922). 3*s*. 6*d*. net.

PARTICULARLY since the introduction of the theory of relativity, the problem of the ether has been a bone of contention among physicists. They have been divided into two camps; one unwilling to let go the idea of an ether, though perhaps in modified form, and the other seeing in the theory of relativity, if not the negation of an ether, at least something that rendered it no longer necessary. In view of this, it is to be welcomed that Prof. Einstein's inaugural lecture on "Ether and the Theory of Relativity," which was delivered in 1920 at the University of Leyden, has been made accessible to the English scientific public.

"The endeavour toward a unified view of the nature of forces leads to the hypothesis of an ether," and in the first lecture in this book is to be found an excellent account of the various phases through which the ether-conception passed in the forward trend of physical research. The ether gradually became divested of its mechanical properties until, with the advent of the special theory of relativity, it was deprived of the "last mechanical characteristic which Lorentz had still left it"—its "immobility." But "to deny the ether is ultimately to assume that empty space has no physical qualities whatever," a view with which the fundamental facts of mechanics do not harmonise.

"According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there would not only be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it."

The second lecture, on "Geometry and Experience," is an expanded form of an address delivered in 1921 to the Prussian Academy of Science in Berlin. In geometry, "axioms are free creations of the human mind. All other propositions of geometry are logical inferences from the axioms," and "the matter of which geometry treats is first defined by the axioms," or what Schlick aptly calls "implicit definitions." But geometry first becomes a natural science "by the co-ordination of real objects of experience with the empty conceptual framework of axiomatic geometry." "Geometry predicates nothing about the relations of real things, but only geometry together with the purport of physical laws can do so." The question as to the nature of the structure of a continuum is a physical one to which experience must supply the answer, and we must acknowledge Riemann's geometry to be correct "if the laws of disposition of practically rigid bodies are transformable into those of the bodies of Euclidean geometry with an exactitude which increases in proportion as the dimensions of the part of space-time under consideration are diminished."

The question of the spatial finiteness or otherwise of the universe appears to be definitely a "pregnant question in the sense of practical geometry." Einstein discusses this problem in its various aspects from the view-point of the results of the general theory of relativity, and shows how, by the use of an analogy in two dimensions, we may form a mental picture of a three-dimensional universe which is finite, yet unbounded, and not Euclidean, but spherical. He aims at showing "that the human faculty of visualisation is by no means bound to capitulate to non-Euclidean geometry."

To all lovers of logical and exact thought who are interested in the developments that have arisen in the wake of the theory of relativity, this book can be warmly recommended. The work of translation has been admirably done, and much of the *finesse* of expression characteristic of Einstein's writings has been retained.