

the community to arrest the threatening decay of scientific life; but there is no discussion of the obstacles in the way of such a simple solution. It is an emotional rather than an intellectual analysis. Such questions occupy four of the five parts into which the book is divided.

It is in the last part that Einstein turns to matters more specifically scientific. Here he discourses very briefly on a variety of methodological and philosophical topics: scientific truth, methods of theoretical physics, various aspects of relativity; Kepler, Newton, Clerk Maxwell, Bohr, Planck, and many others. Many parts of it were delivered as lectures to various bodies. Here again the transparent sincerity of the man shines through everything he writes.

Experience, according to Einstein, is the alpha and omega of all our *knowledge* of existence, but the reasoning mind makes its specific contribution in the logic of science, and that contribution lies in the basic concepts of mechanics. Every attempt at a logical deduction of these basic concepts from elementary experience, he argues, must be doomed to failure; they are creations of the imagination,

not given realities. Pure thought nevertheless can grasp reality, but in the last resort experience must always remain the sole criterion of the utility of any such mathematical construction. The mind grasps this reality that exists outside it, and creates in addition basic concept by means of which it organises and understands that experience. The mind is thus a creative force in Nature, but there must exist an external reality upon which it must operate.

The treatment at this level would have been complete, in broad outline at any rate, had Einstein recognised the significance of the question suggested by the evolutionary outlook, namely, how far the mind of man is itself restricted and conditioned historically by the objective world, and thus how far the validity of the logic of science is affected by the fact that the reasoning capacities of man, although presumably ever-sharpening are nevertheless never perfect. In this way would the problem have been raised whether these basic mechanical concepts that serve in science to unify experience are indeed 'free' creations of the imagination.

H. L.

Ideal and Real Crystals

Ideal- und Realkristall

(Sonderheft der Zeitschrift für Kristallographie, Band 89, Heft 3-4.) Pp. 193-416. (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1934.) 17.60 gold marks.

WHEN one of the editors of the *Zeitschrift für Kristallographie* received almost simultaneously two papers on the above subject, it occurred to him that a valuable opportunity had arisen of securing an adequate review and discussion of this important topic by devoting to it a separate issue of the *Zeitschrift*. As a sequel to this happy inspiration, a double-number has now appeared, which contains an introduction by Prof. Niggli himself, followed by thirteen papers and one shorter note on the same subject. The papers are all printed in the language in which they were written, with the result that half of them are in English and half in German.

The series of papers opens with an important contribution by Prof. Buerger, from the Massachusetts Institute of Technology, on "The Lineage Structure of Crystals", in which he demonstrates the widespread occurrence of a phenomenon analogous to dendritic or arboraceous growth, giving rise in massive crystals to a structure

which appears as a 'mosaic' when viewed only in two dimensions, but is often a complex three-dimensional structure of nearly parallel branches springing from a single stock or nucleus. The impression thus created, that crystal structures are predominantly tangled, is happily corrected by a final brief note by Dr. Buckley, from Prof. W. L. Bragg's laboratory in Manchester, in which he shows that crystals of potassium sulphate, grown in a thermostat in presence of a dye-stuff, and allowed to dry without the assistance of filter or blotting paper, can be obtained in a state of such perfection that magnificent interference patterns between parallel faces can be observed with monochromatic light. Many other examples of a similar character are cited, and it is clear that the imperfections, which formed the original subject of discussion, are far from being universal, and that real crystals can in fact approach very nearly to the ideal.

Limitations of space forbid any reference to the other papers of the series, but it is to be hoped that the unfavourable rate of exchange, which increases the price to English readers to about thirty shillings, will not prevent them from being widely read and studied in Great Britain.

T. M. L.