

situation, which for any other people might be looked upon as crushing, as no more than a phase which will pass.

It is no exaggeration to say that Sir Aurel Stein's record will rank with the great books of travel. In point of style it contains what is probably his best work. A restrained but vivid narrative sustains its interest from the first page to the last. No little praise is due to his publishers, who evidently have spared no pains to give his story a worthy setting. Few if any books of travel and archaeological exploration have been more liberally and adequately illustrated, while the reproductions in colour of Buddhist paintings deserve the highest commendation.

Old Wine and New Bottles

A Text-Book of Physical Chemistry. By Dr. J. Newton Friend. (Griffin's Scientific Text-Books.) Vol. 1: *General Properties of Elements and Compounds.* Pp. xii+501. (London: Charles Griffin and Co., Ltd., 1932.) 24s. net.

"WENT to the Royal Institution last night in hopes of hearing Faraday lecture, but the lecture was given by Mr. Pereira upon crystals, a subject of which he appeared to be master, to judge by his facility and fluency. . . . Met Dr. Buckland and talked to him for an hour, and he introduced me to Mr. Wheatstone, the inventor of the electric telegraph. . . . There is a cheerfulness, an activity, an appearance of satisfaction in the conversation and demeanour of scientific men that conveys a lively notion of the *pleasure* they derive from their pursuits."

Thus far the author of the Greville memoirs under date March 17, 1838.

Nearly a century has passed, and a modern lecture on crystals, still most appropriately given at the lecture table of the Institution, would reveal secrets of atomic structure far transcending the scope of the discourse of the learned Dr. Jonathan Pereira; nevertheless, our men of science bear very lightly the vast weight of a century's accumulated knowledge, and cheerfulness and activity still dominate the conversations of the Royal Institution.

They who work on border-line subjects may be expected to feel most heavily the pressure of this accumulation. The physical chemist of to-day has to be both physicist and mathematician, at home with the developments of quantum theory, and competent to handle the theorems of statistical mechanics. Withal, there is scarcely anything of

the older knowledge which he can afford to shed, and it will be an ill day for him when he loses the outlook peculiar to the chemist. The phase rule and Le Chatelier's theorem are weapons as potent as ever they were; and the skilled chemist must have at command much detailed knowledge of thermal and optical quantities, of surface and viscous forces, of equations of state and kinetic theory; in short, he must be well acquainted with the topics discussed in the first volume of Dr. Newton Friend's treatise, and with much besides.

In a brief review, it is impossible to do more than to summarise the headings of the twenty-two chapters which the book comprises—elementary kinetic theory, vapour pressure, critical phenomena and gas liquefaction, change of state, volume relations, the crystalline state, viscosity, surface tension, optical properties, solubility, diffusion, osmosis, adsorption and the colloidal state are chief among the properties dealt with in this first volume.

It is significant that, with such a list of subjects under review, the general index to the volume contains no entry under the heading 'quantum', nor are the names Debye, Einstein and Bragg listed. It must be said emphatically that this remark is not made by way of criticism—it serves merely to show that, in this volume at least, the author is concerned to deal with that mass of basic older knowledge with which every chemist may be expected to be conversant.

The treatment of these topics is, within the limits indicated, fairly full, though on the whole elementary in outlook. It would surely save time and trouble if, for example, the 'equal-root' method of deducing the critical constants in terms of those of the equation of state were abandoned for the more general method which involves writing down the analytical condition for a point of inflexion with a horizontal tangent. Not every equation of state is a cubic equation.

Two minor points may be noted. In the diagram on p. 99 representing the law of rectilinear diameters, the diameter is surely sloping the wrong way (compare van't Hoff, "Vorlesungen", vol. 3, p. 19). Again (p. 262), we read that the general relation connecting surface tension and temperature is

$$\sigma = \sigma_0 (1 - \alpha t + \beta t^2),$$

which it certainly is not.

The remaining volumes of Dr. Friend's treatise will be awaited with interest.

ALLAN FERGUSON.