SCIENTIFIC BOOKS

Theoretical Chemistry. By WALTER NERNST. Trans. from revised seventh German edition by H. T. TIZARD. New York: The Macmillan Company, 1916. 22 × 15 cm.; pp. xix + 853. Price, $5.00.

This is a translation of the seventh German edition and as such is welcome. It would have been more welcome, however, if the publisher and the translator had been courageous enough and enterprising enough to have issued the volume some years ago. As it is, everything in the book is at least five years old and, in addition, the translator says: "The character of the work is slowly changing, since it is no longer possible in a book of this size to describe fully all the modern developments of theoretical chemistry. The new matter in this edition is therefore concerned mainly with Nernst's own researches. For example, there is a very interesting and clear account of the modern theory of solids, but, on the other hand, practically no mention of the recent advances in radio-activity and the atomic theory. These inevitable restrictions will hardly detract from the value of the book."

This is certainly a very tactful way of saying that Nernst is not willing to take the trouble to revise any parts of the book except those dealing with his own researches. In spite of the impossibility of describing fully the modern developments the translator has induced Professor Tutton to bring up to date all sections in the book dealing with crystallography.

In looking over a book like this, one is struck with passages which would have escaped notice three years ago. On p. 156 Nernst deduces that the osmotic pressure of a substance in mixed solvents follows the gas laws. He states that the resulting formula was verified satisfactorily by Roloff and then points out that the addition of potassium chloride to aqueous acetic acid may raise the partial pressure of the acetic acid. Most of us believe in some things which we know are not so; but it takes a special type of mind to claim that we have proved a thing in the same breath that we mention facts which disprove it. The case is not so striking on p. 707 where Nernst formulates the generalization that if two phases are in equilibrium with a third phase at a certain temperature with respect to a certain definite reaction, they are then in equilibrium with each other at the same temperature and with respect to the same temperature. This differs from the preceding case because no data are given to show the inaccuracy of the theorem. Nernst knows as well as anybody that an aqueous solution saturated with respect to sodium chloride is not in equilibrium with an alcoholic solution saturated with respect to sodium chloride at the same temperature; but the glamour of the phrase is upon him and he does not analyze it to see that what he has said is not the same as that two things which are equal to the same thing are equal to each other, though it may sound like that. This curious mixture of keenness and self-delusion is no longer an isolated phenomenon. We now know that it is a national weakness.

On p. 570 Nernst is quite willing to state that methyl orange is a basic indicator and that the acid function of methyl orange is unimportant as regards change of color; but he will not mention the fact that Ostwald holds an entirely different view. The people who read Ostwald's books also never learn that anybody questions the opposite view. It would be incompatible with the dignity of either to admit that he was wrong. Consequently the student who reads one set of text-books learns one group of facts as unquestioned, while he who reads another set of text-books learns another group of facts without any suspicion that these things are not accepted universally. Incidentally, it might be mentioned that Kahlenberg's name does not appear anywhere in the book and that there is no reference anywhere to any of the objections raised by Kahlenberg.

While one may object seriously to the order in which the subject is presented and to the spirit in which the book is written, there is no gainsaying the fact that Nernst is an ex-

tremely able man and that his book contains a great deal of valuable information. The mere fact that it has been through seven German editions is proof in itself that people read it. There is a fine sound to the subdivisions of the book: the universal properties of matter; atom and molecule; the transformation of matter; the transformation of energy. What could be better than this? When a man sandwiches a chapter on colloidal solutions in between one on radioactivity and one on the absolute size of the molecules, one is almost tempted to forgive him for talking about the enormous molecular weights of substances in the colloidal state. In a great many chapters what Nernst has to say is very well worth while and of course it is not fair to read the parts on colloid chemistry, photochemistry, and flame spectra in the light of what one now knows. It is possibly the war, though I think not; but the whole tone of Nernst's book grates on one, perhaps more when it is presented in English than when one reads it in German. The contrast between this book and van't Hoff's Lectures is very striking.

The translation is very much better done than has been the case in most of the previous English editions. Either the translator or the proofreader has been very careless, however, in regard to proper names, many of which are misspelled.

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SPECIAL ARTICLES

THE MEASUREMENT OF LIGHT IN SOME OF ITS MORE IMPORTANT PHYSIOLOGICAL ASPECTS

The principal relations of light to organisms include the following phases of its action:

1. Photosynthesis, in which specialized protoplastic masses containing chlorophyll elaborate carbohydrates from carbon dioxide and water. The well-known absorption bands of chlorophyll in the red and in the blue are taken to indicate the portions of the spectrum concerned in this action.

2. Influence of illumination on transpiration and water content. It is probable that the red end of the spectrum chiefly furnishes the wave-lengths which cause changes in temperature, and variations in water loss.

3. Influence of illumination on the respiration and other metabolic processes in protoplasm as induced by the photolysis of substances important to the life of the organism.

4. Coagulatory, neutralizing or disintegrating action of light or toxic effect of products, especially of the shorter wave-lengths, on living matter as exemplified by the fatal effects of blue-violet rays on minute organisms.

5. Tropistic reactions, in which the position of the axes or of the entire body is changed in response to direction or intensity of the rays and with respect to special wave-lengths. Various parts of the spectrum may be active in different organisms.

6. The indirect action of light on rate, course and amount of growth, together with morphogenic reactions. Such effects have not yet been analyzed to an extent which might furnish data for a rational discussion of the direct effects of light on growth. Indirect effects are recognizable.

7. Action of light on environic conditions exemplified in the ionization of the air by the shorter wave-lengths as described by Spoehr.

Experimentation upon any of these subjects requires sources of light under good control, screens for transmitting special regions of the spectrum and methods of measurement of the relative intensity of the illumination falling on the organism.

Sunlight may serve in some work when the requisite screens are available, but incandescent filaments, mercury and amalgam vapor arcs enclosed in glass or in quartz may be used as sources of light down to wave-lengths of .28 μ.

Layers of liquid, pigments in gelatine and other perishable screens have served admirably in some demonstration and research work, but when long-continued exposures to intensities approaching those of normal sunlight are desired a durable screen is necessary. A series of formulæ for a number of glasses which would transmit various parts of the spectrum has been developed in the laboratory of a prominent firm of glass-makers. These may