

to the Committee, now presents an interesting report on the results obtained for single-bay and two-bay arrangements, and discloses the surprising fact that quite slight differences of some kind in the connexions result in considerable variations in the stresses. Even with the use of the experimental refinement of a 'torque control' spanner for the joint bolts, discrepancies of a fair amount still existed. Dr. Faber deals with the tests and stresses in the steel frame structure at the Museum of Practical Geology, South Kensington; while Prof. Batho and others discuss very fully experimental and analytical work on joints, bolts and connexions. This last includes interesting and unusual work on bolt stresses and torque control in tightening. In fact the 'torque control' spanner is a surprising but noticeable and recurring feature of this report, and we may be allowed to wonder whether it will ultimately appear in building codes.

The report also contains an excellent discussion on analytical methods by Dr. Baker, including a treatment of mechanical analysis by models. There is a concluding section of distinct importance on the strength of welded joints carried out for the Committee at the National Physical Laboratory and containing valuable results on the hitherto somewhat neglected aspect of fatigue strength. Altogether this report contains a vast amount of vital information. It requires careful study; but the study will be well repaid.

#### Electrokinetic Phenomena

*Electrokinetic Phenomena and their Application to Biology and Medicine.* By Dr. Harold A. Abramson. (American Chemical Society, Monograph Series, No. 66.) Pp. 331. (New York: The Chemical Catalog Co., Inc., 1934.) 7.50 dollars.

DR. ABRAMSON'S monograph is planned partly on historical principles. In his first chapter he records the discovery of the phenomena classified by colloid chemists as capillary-electrical or electrokinetic, namely, the flow of fluid past a wall and the movement of a small particle caused by an electric current, and the converse phenomena, referred to as the flow potential, set up by the movement of liquids through porous diaphragms. In the second chapter, he describes the correlation between these phenomena and potentials at surfaces, worked out by Helmholtz and by Smoluchowski. More recent work, based on the conception that an ion atmosphere is present at the surface, due to Gouy and to Debye and Hückel, is recorded in the fourth chapter.

Experimental methods, including the apparatus used by Abramson in his studies of particles coated with proteins, are described in the second chapter,

and the remaining chapters describe experiments on proteins, inert surfaces, inorganic and organic surfaces, gases, blood cells, bacteria and related systems. From some points of view, an arrangement in which the simpler systems are dealt with first might be preferable, but there are certain advantages in considering the proteins first. In the words of the author, "Although the proteins are complicated from the point of view of their chemical structure, from another aspect they are less complicated than any other surface to be discussed here, for the reason that the average electric charge  $Q$  per dissolved molecule can be determined by a thermodynamic method. This charge so determined, can serve as a reference with which the validity of the theories of electrokinesis . . . can be tested".

In the account of the thermodynamic method, evidence is recorded in favour of the view that protein chlorides are fully ionised in dilute solutions, and it is concluded that the charge can be calculated from the acid or base bound, as measured by the hydrogen electrode. It is shown that such titration curves can be superposed on curves showing the relationship between mobility and  $pH$  value, recorded by Tiselius and by other investigators. These observations support the thesis that, in some respects at least, the protein surfaces are particularly favourable for experimental investigations. It may be noted that the observations of Freundlich on inorganic surfaces showed no correlation between electrokinetic and thermodynamic potentials.

In a field complicated by many unknown factors, the discovery of simple relationships is of great value, but in a review of the work it is perhaps advisable to point out that there are certain qualifications of the conclusions drawn by Abramson, which have not been stated in his book. In the first place, the amount of acid or base combined with a protein at a given  $pH$  is not independent of the amount of neutral salt present, as shown by Sørensen, Linderstrøm-Lang and Lund.

In the second place, it may be noted that since the publication of this book, additional evidence concerning the validity of the author's method has been obtained by comparing measurements of titration curves and valences calculated from membrane potentials, and it would appear that the results calculated from titration curves may be subject to appreciable corrections.

Although differences of opinion may be held on certain points, there is no doubt that Dr. Abramson's book should advance the study of electrokinetic phenomena, as he has brought together recent work on the physical theory of the double layer, and experimental data obtained in the fields of chemistry, biology and medicine.