Introduction 1

Acid–base diagrams, better called pH-logc_i diagrams, are the most beneficial tools that have been developed to describe acid–base equilibria. They present the interrelations between the logarithm of all equilibrium concentrations c of the species i and the pH value of the solution. They make it possible to find the approximate pH of solutions of acids and bases and buffers without any math calculations. They can be applied to find out what approximations in the math calculations of the pH (or concentration of any species) are allowed under certain conditions. These acid–base diagrams can also be used to construct titration curves to extract the most important data, such as pH at the equilibrium point. Good training in the use of these diagrams is necessary for a wide range of science studies. This book provides the basics as well as a good number of applications.

pH-logc_i diagrams have several fathers (Fig. 1). The Danish chemist Niels Bjerrum introduced the coordination system in 1915 [1], the Swedish chemists H. Arnfelt [2] and G. A. Ölander [3] further developed them, and finally the Swedish chemists G. Hägg [4] and L. G. Sillén [5, 6] popularized them on an international scale. The latter led to these diagrams being called Hägg diagrams in Germany and Sillén diagrams in the USA [7].

This book provides a consistent presentation of material, and the reader can use it without consulting additional literature. Of course, there are a number of textbooks and monographs that can be consulted [7, 9–16], as well as a number of original journal papers.

The complete book is based on the acid–base theory of Brønsted (Brönsted) and Lowry, according to whom acids are proton donators and bases are proton acceptors. All other acid–base theories are not discussed here, and we refer to the respective literature [9, 17].

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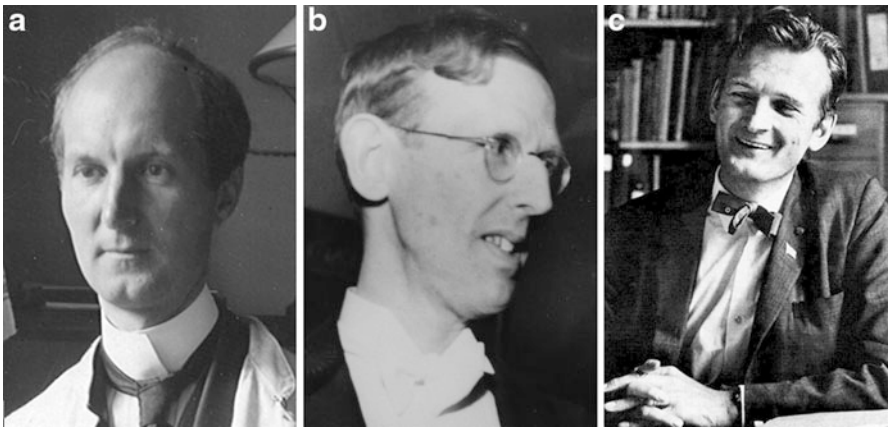

Fig. 1 **a** *Niels Bjerrum* (March 11, 1879, Copenhagen, Denmark – September 30, 1958, Copenhagen, Denmark). Bjerrum studied chemistry in Leipzig, Zurich, Paris and Berlin. He obtained a Ph.D. from the University of Copenhagen in 1908. From 1914 to 1949 he was Professor at the Royal Veterinary and Agricultural College in Copenhagen. His research concerned acid–base equilibria and electrolyte solutions. (Copyright Morten J. Bjerrum Reproduced from [8]). **b** *Gunnar Hägg* (December 14, 1903, Stockholm, Sweden – May 28, 1986, Uppsala, Sweden) studied chemistry in Stockholm, and in 1936 he became Professor in Uppsala. His main research area was X-ray diffraction. (Archive, University of Uppsala). **c** *Lars Gunnar Sillén* (July 11, 1916, Stockholm, Sweden – July 23, 1970, Danderyd/Stockholm) studied chemistry in Stockholm, and was a Professor of Inorganic Chemistry at the Royal Institute of Technology, Stockholm from 1950. At the beginning of his career he also did research in X-ray diffraction, but later he turned his interest to chemical solution equilibria and sea chemistry. Sillén was a pioneer in applying computer programs to the calculation of chemical equilibria, and his research group was most productive in providing new estimations of highly reliable equilibrium constants (Svenskt biografiskt lexikon)

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