

Preface

This book represents the essential part of the course "Non-covalent Interactions in Proteins: Structure, Stability, Function" held as a part of the "Postgraduate Program in Nanobiology and Biological Physics" of Karolinska Institutet, Stockholm. As far as Karolinska Institutet is a medical university, one could expect that the course is adapted for students with background in biological sciences. This is partially true. Because the course is regularly visited by students from other universities in Stockholm, as well as from Uppsala University and Linköping University, its content is adapted for students of different backgrounds and different interests.

Textbooks on physics of condensed matter consider non-covalent interactions in detail, however their application for analysis of protein properties is often poorly presented or missing. On the other hand, books on biochemistry, molecular modelling or molecular simulation introduce these interactions in the context of the corresponding topic, which sometimes results in sparing of explanations of their nature. The aim of the present book is to unite the considerations of non-covalent interactions with the specificity of their application in protein sciences in a single reading. This includes comments on the nature of the different interactions and their manifestation in protein properties, derivation of the formulae most frequently used for the analysis of non-covalent interactions in proteins and the methods for their calculation. Although the derivation of the various formulae can be found in the specialised textbooks, here the derivations are presented step by step, sometimes even to a level that might look trivial. The purpose of this is to diminish the unnecessary fear of mathematics that some students have inherited

from their previous education. In this way, the book can be a useful aid for students of biology, biochemistry, or biomedicine who want to extend their knowledge about how protein properties are described on a molecular level. At the same time, the present book can help students of physics or chemistry who have interests in biology and biophysics.

Attention is paid on the terminology, which sometimes is differently used in the different disciplines of science, thus leading to ambiguity and misunderstandings. To make the material closer to the everyday language of biological sciences, and hence to the intuition of the reader, some of the terms do not meet exactly the requirements of the rigorous canons of physics. Thus, for instance, temperature is given in Celsius, although in thermodynamics the absolute temperature must be used. Hopefully, this can help the inexperienced reader to sharpen his or her attention when reading scientific literature, where the two temperature scales are used with a comparable occurrence. Due to the same reasons, the energy units are given in calories (cal/mol or kcal/mol), instead in Joules (J/mol or kJ/mol).

The literature quoted refers to the works which to the best knowledge of the author are pioneering in the corresponding field.

Last, but not least, the author would like to acknowledge the stimulation and the sincere support of Prof. Rudolf Ladenstein during preparation of the material. The author especially thanks Associate Professor Vladimir Pericliev for his valuable help in the preparation of the manuscript.

Andrey Karshikoff