
To molecular biologists, the hydrogen bond has become synonymous with the biological specificity of macromolecules. Exploration of the role of the H-bond in molecular recognition is one of the few aspects of physical chemistry that molecular geneticists are prepared to take on board in designing both in vitro and in vivo mutagenesis experiments. To molecular biologists (for whom the book is written), the role of the H-bond in molecular recognition is conceptually easy to both understand and examine experimentally. The hydrophobic effect, on the other hand, is much more of a taboo subject for experimental molecular biologists. Perhaps the main reason for this is the directionality and linearity used to represent H-bonding in biological systems. Whereas non-linear physical relationships present a challenge to the physicist, they are the source of headaches to the biologist. Therefore, when Watson and Crick produced their elegant model for the structure of DNA, biologists immediately grasped the simplicity of directional hydrogen bonding, and much less so, features of the base-stacking interactions.

The maintenance of the tertiary structure of proteins and the interaction of proteins with ligands (and other proteins) can be systematically explored by using site directed mutagenesis to remove and displace H-bond donors and acceptors. Therefore, a standard reference on the H-bond is a most welcome addition to the literature as biologists embark on increasingly ambitious molecular recognition studies. In order to pose more subtle questions, a detailed knowledge of the H-bond is required. That the bulk of the literature concerning experimental and theoretical aspects of H-bonds is inaccessible to biologists is a fact. The authors have therefore provided the biological community with an invaluable reference source to sharpen thinking about new experiments in molecular recognition.

The authors set out to cover in great detail the definition, experimental and theoretical description of H-bonding in small molecules (of biological interest), macromolecules and the special place of water in the scheme of things. There is a discussion of the geometry and lengths of different classes of hydrogen bonds. The treatment I found both readable, comprehensive and an invaluable encapsulation of a literature which is largely alien to me, although clearly of real significance to the biologist. By far the most frequently cited experimental techniques used to underpin the authors' discussion are X-ray and neutron diffraction and their bias is towards static images of H-bonds in crystalline structures. At this stage, however, I would agree that we need a description of H-bond geometry in the static state before we begin to explore a 'moving target' by magnetic resonance techniques.

My only real criticism of the book is the cursory treatment of the use of site directed mutagenesis in conjunction with X-ray crystallography and thermodynamic/kinetic experiments to address the role of H-bonding in protein stability, folding and ligand binding. This is a prime area of interest for biologists and the authors are most able to make an input here into the design of new experiments and the suggestion of aspects of H-bonding that have as yet not been addressed. Of course this, it may be said, can now be done with more confidence having read the book, but it would have been useful to have expanded this section.

I welcome the addition of this book to my shelf since it provides a firm physio-chemical foundation for exploring and evaluating the role of H-bonding in biology. With the relatively routine ability to introduce selective point mutations into proteins (and nucleic acids), this book provides a perfect companion for the biologist as a first step towards designing such experiments.

David Hornby


This short book includes ten review essays which were presented at a Royal Society of London Discussion Meeting on Enzyme Catalysis in December 1990. The authors, all major figures in the enzyme field, present an excellent and representative review of the current state of enzymology.

Three articles by Robinson, Cane and Gani show how organic...
Hydrogen Bonding in Biological Structures is informative and eminently usable. It is, in a sense, a Rosetta stone that unlocks a wealth of information from the language of crystallography and makes it accessible to all sciences.

Abraham Joshua Heschel said, “The only thing necessary for the triumph of evil is the good remaining silent.”

Hydrogen Bonding in Biological Structures

Professor Dr. George A. Jeffrey, Professor Dr. Wolfram Saenger.

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ABSTRACT: Mycolactone molecules are responsible for Buruli ulcer disease. Geometric, energetic and spectroscopic parameters of hydrogen bonding reaction on each of the nine oxygen heteroatoms of mycolactone A/B have revealed that the O5sp2 heteroatom is far away the hydrogen bonding site. The identification of such a site constitutes a tool for working out a methodology for the annihilation of the destruction effects of mycolactones.