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Book Review

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The Weak Hydrogen Bond In Structural Chemisty and Biology

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The topic of the "weak hydrogen bond" has been discussed in details by the authors of this monograph in a number of highly regarded review articles. Those articles build the base for the book onhand. Already on page 4 the definition of the weak hydrogen bond is given: The weak hydrogen bond may be defined as an interaction X-H···A wherein a hydrogen atom form a bond between two structural moieties X and A, of which one or even both are only of moderate to low electronegativity. For the description of weak interactions the used geometric structure and energy parameters are defined and exemplified. The experimental base for the studies of weak interactions are finally given by the diffraction methods (X-ray and Neutron-diffraction), vibrational spectroscopy and gas-phase-rotational spectroscopy.

Chapter 2 deals with C-H···O and C-H···N-weak hydrogen bonds. The impact of those interactions towards structural, crystallographical and spectoscopical phenomena are outlined in an impressive way. The accurate use of the distance criterion is thorougly discussed.

Further variations of these interactions with other acceptors, for example C-H···F, O-H···π, or the following donors S-H, P-H, Se-H, Si-H etc. are presented in Chapter 3. The diversified structural facilities are pointing out that these interactions are useful for the construction of extended hydrogen bonds, for instance of construction of supramolecular structures. Those are described in Chapter 4. Here it is shown, that besides well known synthons with O-H···O and O-H···N interactions also synthons with C-H···O and C-H···N weak hydrogen bonding may lead to similar structural macromolecules, leading to an enhanced insight in the packing of the synthons within this concept.

Chapter 5 is dedicated to the weak hydrogen interactions in biological structures. Numerous statistical evaluations give raise for a large part of C-H-donors and π-acceptors in protein structures. For example the analysis of the geometry C_α-H···O=C interaction in β-sheets of 11 high resolved protein structures clearly indicates the influence of weak hydrogen interaction. Other important biological compounds e. g. cellulose do also require these weak interactions in order to understand and construe their structures.

In summary, this book does reflect on all aspects of the weak hydrogen bond. Around 850(!) literature citations enable a fast and more intense entrance in selected areas. For the structural interested reader this book is an exciting and substantial reading.

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