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ORGANIZED ASSEMBLIES PROBED BY FLUORESCENCE SPECTROSCOPY

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1.1 INTRODUCTION

Self-organized assemblies originate in an aqueous solution because of the tendency of a biological macromolecule to expose its hydrophilic part to water and to bury the hydrophobic portion away from water. Examples of such assemblies range from the simple biologically active structure (native form) of a protein and the DNA double helix to complex supermolecules, quasi-crystallites and aggregates of amphiphilic molecules (e.g., micelles, vesicles). Structures of some organized assemblies are shown in Fig. 1.1. They play a key role in molecular recognition, bio-catalysis, targeted drug delivery, and in many biological areas such as dynamic combinatorial chemistry, and adaptive chemistry.

The polarity and solvation demands in the hydration layer of the organized assemblies are crucial in many biological processes. The very high polarity (dielectric constant) of water arises primarily from its extensive hydrogen-bond network and associated polarization of the water molecules in close proximity. Although in polarization the dipole moment of water in the liquid phase is 1.85 D, it is higher than that in water (1.85 D) when a molecule is bound to a macromolecule (can fix polar water molecules, thus forming a "locked" network) in the dielectric contact of the hydrophobic part of an organized assembly compared to bulk water. In recent years, few research groups have concentrated their efforts on a wealth of information on the polarity and solvation dynamics in many organized assemblies. The fluorescence data is complemented by other some spectroscopic (e.g., IR, Raman, neutron and dynamic light scattering) and dynamic (e.g., fluorescence correlation spectroscopy) studies in this area.

The present book will discuss the important developments in organized assemblies. A general picture of this subject will be derived by following dynamics of water (and other small liquids) and how it is organized. The organized water displays a specific nature of

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