h) Rheology
i) 1H NMR spectroscopy with layer-by-layer freezing-out of bulk and interfacial water
j) XRD and neutron diffraction
k) Adsorption, surface charge density and zeta-potential
l) As well as other chemical, biochemical and biophysical methods (Chaplin 2000).

Close to the surface, the hydrogen bond network is distorted as hydrogen bonds among water molecules are partially substituted by bonds between water and surface. All the experiments and simulation results seem to provide a rather coherent picture of the behaviour of interfacial and confined water near hydrophilic surfaces. The mobility of molecules directly adsorbed on the hydrophilic surface is reduced by more than one order of magnitude, whereas for full hydration water molecules at a longer distance from the surface exhibit short diffusion coefficients close to that of the bulk.

On hydrophilic substrates, water was usually found to have a higher density than in the bulk, and its structure and dynamics have sometimes been compared to those of supercooled water and amorphous ice. Table 1 summarizes many differences (Clegg and Drost-Hansen 1991).

Water adsorbed on polymer surfaces is distinct and behaves differently from predictions based on bulk water. Using a hydrogel, Gerald H. Pollack (Pollack 2001) plunked a piece into a chamber and suffused it with an aqueous suspension of microspheres. As soon as the liquid suspension met the gel, the microspheres began moving away from the gel's surface leaving a microsphere-free zone just under 100 micron wide. Water remained in that zone but microspheres did not. Microspheres of all kinds were excluded; they ranged in size from 10 microns down to 0.1 microns and were fabricated from diverse substances. Even red blood cells, several strains of many sizes and bacteria were excluded. The protein albumin was excluded, as were various dyes with MW's as low 100 Da, only a little larger than common salt. The experiments showed that the free zone close to the gel surface (Exclusion Zone, EZ) (Pollack 2013) rather broadly excludes substances of many sizes from very small to very large and once formed, the zone remained intact. Almost any hydrophilic surface can generate an EZ, and the EZ excludes almost anything suspended or dissolved in the water. Many experiments showed that the water in the exclusion zone differs in

Table 1. Comparisons of pure and vicinal water properties.

Comparison of some properties of pure and vicinal water		
Property	**Bulk**	**Vicinal**
Density (g/cm^3)	1.00	0.97
Specific heat (cal/Kg)	1.00	1.25 +/– 0.05
Thermal expansion coefficient ($ºC^{-1}$) (adiab.) Compressibility coefficient (Atm^{-1})	250×10^{-6} (25ºC) 45×10^{-6}	$300–700\times10^{-6}$ $60–100\times10^{-6}$
Excess sound absorption (cm^{-1} x s^2)	7×10^{-17}	Circa 35×10^{-17}
Heat conductivity ((cal/sec)/cm^2/ºC/cm)	0.0014	Circa 0.01–0.05
Viscosity (çP)	.089	2–10
Energy of activation ionic conduction (Kcal/mol)	Circa 4	5–8
Dielectric relaxation frequency (Hz)	19×10^9	2×10^9