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Hydrophobicity: one concept or many?

For understanding aqueous solvation and wetting phenomena, we can all agree that hydrophobicity is important. We might be less ready to agree on what it actually is. It takes on a slightly different meaning to a protein chemist and to a surface scientist, and there have been several different proposals for assigning it a quantitative measure. The “hydrophobic effect” is generally recognized as a vitally important ingredient of our understanding of protein folding and ligand binding in biochemistry, but there is ever more reason to believe that this is not a simple or indeed even a single phenomenon. And the deceptively straightforward notion of “repelling water” may turn out to have some counter-intuitive aspects, whereby hydrophobes become hydrophiles and vice versa. I will examine these different views of hydrophobicity and ask whether, after all, it is still useful to speak in terms of this single concept.