

# UNH Materials Science Seminar

11:10-12:00, Thursday, March 12, 2009

DeMeritt Hall 240

University of New Hampshire

## Designing Oleophobic Surfaces

### Prof. Gareth H. McKinley

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It has long been known that the combination of surface chemistry and topology can strongly amplify the wetting (or non wetting) properties of a substrate. With recent developments in nanofabrication it has become possible to achieve unprecedented control over the microtexture of a surface and this can result in almost perfect ultrahydrophobicity. What is much less easy to achieve is *super-oleophobicity* or resistance to wetting by low interfacial tension liquids such as hydrocarbons. In this talk I will demonstrate how molecular-level dispersions of perfluorinated nanoparticles (FluoroPOSS) can be used to systematically control both the hydrophobicity and oleophobicity (oil-repellency) of polymer substrates. By studying electrospun polymer fiber mats we show how local surface curvature (in conjunction with surface chemistry and overall roughness), can be used to significantly enhance liquid repellency. The chemical and topographic mechanisms behind this repellency are elucidated by lithographically producing model microtextured surfaces in silicon which feature strongly re-entrant structures (referred to as 'micro-hoodoos' because of their similarity to geomorphological features). The resulting composite hoodoo surfaces are the most oleophobic ever produced, with alkane contact angles greater than 160° and low hysteresis. These coatings are expected to have a wide range of commercial applications including the fabrics with enhanced solvent/oil resistance, surfaces for reducing biofouling and separation of oil/water dispersions.

**Dr. McKinley** is currently Professor at Department of Mechanical Engineering, M.I.T. He is Director of Program in Polymer Science & Technology and of Hatsopoulos Microfluids Laboratory at M.I.T. Before joining M.I.T., Dr. McKinley was a faculty at Harvard from 1991 to 1997. He received BA, M.Eng. & MA from University of Cambridge in 1985 and 1986, respectively, and a PhD from M.I.T. He has received many awards and honors, including Member of US National Committee for Theoretical & Applied Mechanics (2007), Fellow of the American Physical Society (APS, 2007), MIT Class of 1960 Fellow for Teaching Excellence (2005-2007), Frenkiel Award of APS (2002), Presidential Faculty Fellowship from NSF (1995-1998), Annual Award of the British Society of Rheology (1004), and so on.

Host: Professor Marshall Ming x1446