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1964 Ph.D., California Institute of Technology, Pasadena, CA
1963-1982 Faculty, Massachusetts Institute of Technology, Cambridge, MA
1982 Department of Chemistry, Harvard University
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Honors
1975 American Chemical Society Award in Pure Chemistry
1994 James Flack Norris Award, American Chemical Society, New England Section
1995 Arthur C. Cope Award, American Chemical Society
1996 Defense Advanced Research Projects Agency Award for Significant Technical Achievement
1998 National Medal of Science
1999 The Wallace Ory Innovation Award in High Throughput Screening, The Society for Biomolecular Screening

Self-Assembly and Soft Lithography: An Overview

A combination of five materials/techniques has provided a new set of tools to use in examining and controlling the interaction of biological systems with man-made materials: (1) Self-assembled monolayers (SAMs) of alkanethiolates on gold, to control the character of the interface; (2) "Inert surfaces" (surfaces that do not adsorb proteins and therefore do not allow cells to attach); (3) Surface plasmon resonance (SPR), a technique that makes it possible to observe the kinetics and infer the thermodynamics of adsorption of proteins and other biological macromolecules at the surface of SAMs; (4) Soft lithography, to pattern the interface in its plane; and (5) Controlled, laminar flows in microchannels, which provide the basis for methods both of fabrication inside capillaries and for controlling the environment of cells in these capillaries. This talk will discuss the use of this set of tools in understanding the interaction of proteins with engineered surfaces, and in using surfaces and media patterned in ways that help to explore the interactions of mammalian and microbial cells with these surfaces. Perhaps surprisingly, the former subject has been the more difficult: We do not yet fully understand the mechanism of adsorption of proteins on surfaces. The latter, although still in an early stage of development, shows clear promise of allowing the metabolism of cells to be manipulated through design of the characteristics of the surface to which they are attached.

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