Application of Protein-Chip Based Molecular Recognition Technology to Search for Life in the Solar System

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We propose to develop and to exploit new Protein Chip-based molecular recognition technologies to search for evidence of life in extreme environments on Earth and on the surfaces of planets and other solar system bodies. Surface- Enhanced Laser Desorption/ Ionization (SELDI) technology coupled with time- of- flight mass spectrometry is a rapid method that has the capability for providing a broad spectrum molecular search designed to discover various types of biomolecules and possibly other molecules of unknown chemical composition *in situ*. Molecules will be separated and recognized based on both their chemical and biological properties. Not only will this technology recognize a complex range of organic molecules, but we will be able to determine their molecular weight distributions as well. For this proposed research we will concentrate our work on three areas: 1) The study of the proteomics of microorganisms chosen from diverse positions on the Universal Tree of Life. 2) The study of prebiotic chemistry with SELDI and antibody-binding Protein Chip technologies; and 3) The study of how native biochemicals fare in geochemical environments. The scientific aspects of this work should impact the growing science of Proteomics that will surely influence the direction of microbial ecology in the next ten years. As we gain a greater understanding of the biological inventory of living organisms, we should be able to expand our search for these and other primitive organic materials in ancient sediments and rocks from Earth and beyond.