CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

University of Illinois at Urbana-Champaign

Susan L. Lindquist

Director of the Whitehead Institute
Professor of Biology
Massachusetts Institute of Technology

Susan Lindquist, Ph.D., is the Director of the Whitehead Institute for Biomedical Research and a professor of biology at MIT. Widely known for her groundbreaking work on how changes in protein conformation affect processes such as stress tolerance, neurodegenerative disease and heredity, her work on proteins-the "building blocks" and "workhorses" of life-has given us compelling new insight into genetics, evolution and disease.

Dr. Lindquist, recipient of the prestigious Dickson Prize in Medicine (2003) and the Novartis Drew Award in Biomedical Research (2000), leads research that blends traditional cell biology and genetics with state-of-the-art new technologies. Among her many honors are her memberships in the National Academy of Sciences, American Academy of Arts and Sciences, and the American Philosophical Society. She ignites collaborations of physicists, chemists and engineers studying new things as diverse as yeast, fruit flies, plants and humans.

Her research has provided critical support to a new genetic theory wherein biological changes are passed from generation to generation through assemblies of misshapen proteins rather than through changes in DNA and RNA. This discovery is helping provide a framework for understanding biological mysteries including Alzheimer's, Parkinson's and mad cow disease.

Dr. Lindquist's research has also provided new insight into evolution by proving that some organisms may harbor instructions for sudden, complex changes that can be revealed by environmental stress and bred to produce new forms.

Taking Advantage of Evolution's Bounty: Nanoscale Electric Circuits from Self-Assembling Amyloids

Proteins are complex polymers that must fold into just the right shape in order to function properly. A few proteins, known as prions, sometimes misfold in an unusual manner. They can then influence other protein of the same type to misfold in the same way, creating a highly selective protein-conformational chain reaction. In some cases this seems to cause deadly, infectious diseases, such as mad-cow disease in cattle and Creutzfeld-Jacob disease in humans. In others it simply changes cellular metabolism. In the latter case, because the misfolded protein is passed from mother cells to their daughters, the change in metabolism is inherited. This is an unusual genetic mechanism, because the organism changes in a heritable way due to a self-perpetuating change in protein conformation with no change in its DNA. When one such protein (NM) is purified, it forms amyloid fibers through nucleated polymerization. These fibers have remarkable physical properties: they are 10 nm wide, are very stable, can be grown from solid surfaces and can be functionalized in many ways. The special properties of NM fibers may lead to the development of new types of bio-templated physical materials. As proof of principle, we have used them to create nanoscale electrical circuits; in collaboration with Heinrich Jaeger's group at the University of Chicago.

Wednesday, April 28, 2004
4:00 p.m.
B02 Coordinated Science Lab
Reception immediately following in the lobby of CSL

All seminars are free and open to the public. Times, dates, locations, and titles of events are subject to change. For additional information, please call (217)333-3097, email nano@cnst.uiuc.edu

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