2009 PROGRAM

8:30 a.m. Registration & Continental Breakfast, Room 137, Chemistry-Physics Building

9:00 a.m. Welcome by Dr. Kumble R. Subbaswamy, Provost, University of Kentucky - Room 139, Chemistry-Physics Building

9:10 a.m. Introductory Remarks - Dr. Steven W. Yates, Chairman, Department of Chemistry, University of Kentucky

9:20 a.m. Dr. Michael H. Hecht, Princeton University
"Towards Synthetic Biology: Functional De Novo Proteins From a Designed Artificial Proteome"

Synthetic biology aims to design and construct biological systems from defined components. Initial efforts in this field typically rely on 'toolkits' of genes and proteins borrowed from pre-existing organisms, and recombined into novel arrangements. In contrast, a truly *synthetic* biology would incorporate *novel* macromolecules designed 'from scratch' and synthesized in the laboratory. As an initial step toward this goal, we have constructed a collection of *de novo* proteins (an artificial 'proteome') comprising millions of designed proteins. This presentation will demonstrate that proteins from this artificial proteome fold into well-ordered structures and perform a range of biochemical and biological functions.

10:30 a.m. Break (Refreshments Available)

10:50 a.m. Dr. Alanna Schepartz, Yale University
"Protein Design Without α-Amino Acids"

The catalytic, mechanical and structural fitness of proteins rely on their ability to fold into discrete secondary, tertiary and quaternary structures. Non-natural polymers have the potential for equally complex structure and sophisticated function, but the design of such molecules is even more challenging than protein design, because there exist no natural templates to mimic. This lecture will describe the design, synthesis, high-resolution structure, and biophysical analysis of a series of helical bundle proteins composed entirely of *beta*-amino acids. Like natural proteins containing *alpha*-amino acids, *beta*-peptide bundles fold cooperatively, assembling into structures containing parallel and anti-parallel helices, extensive inter-helical electrostatic interactions, and a solvent-excluded hydrophobic core. Ongoing efforts to elaborate *beta*-peptide bundles with enzyme-like metal-binding and catalysis sites will also be described.

12:00 p.m. Poster Session, Rose Street Concourse, Chemistry-Physics Building

Lunch, Conference Room (CP-137), Chemistry-Physics Building

1:30 p.m. Dr. Peter G. Schultz, Scripps Research Institute
"Synthesis at the Interface of Chemistry and Biology: From Stem Cells to the Genetic Code"

Our research program combines the tools and principles of chemistry with the molecules and processes of living cells to synthesize new molecules and molecular assemblies with novel physical, chemical and biological functions. By studying the structure and function of the resulting molecules, new insights can be gained into the mechanisms of complex biological and chemical systems. Examples of this synergistic chemical/biological approach to synthesis will be discussed including the addition of amino acids with novel biological, chemical and physical properties to the genetic codes of prokaryotic and eukaryotic organisms, and the identification of small molecules that control stem cell self-renewal and directed differentiation, as well as reprogramming of somatic cells.

2:40 p.m. Closing Remarks - Dr. Yinan Wei, Department of Chemistry, University of Kentucky

(http://www.chem.uky.edu/seminars/naff/)

UK Department of Chemistry
University of Kentucky
Lexington, KY 40506-0055

Thirty-Fifth Annual
Symposium on

Chemistry & Molecular Biology

established by M. Benton Naff
in memory of Anna S. Naff

Protein Design and Engineering

SPEAKERS

Michael H. Hecht
Alanna Schepartz
Peter G. Schultz

Friday, April 24, 2009

Department of Chemistry
University of Kentucky
Lexington, KY 40506-0055