2008 PROGRAM

8:30 a.m. Registration & Continental Breakfast, Atrium (Room 1-65), William T. Young Library

9:10 a.m. Welcome by Dr. Kumble R. Subbaswamy, Provost, University of Kentucky - Auditorium (Room 1-62), William T. Young Library

9:20 a.m. Introductory Remarks - Dr. Steven W. Yates, Chairman, Department of Chemistry, University of Kentucky

9:30 a.m. Dr. Thomas J. Meade, Northwestern University
"Seeing is Believing: Biomedical Diagnostics of the 21st Century"

Fundamental biological and clinical questions have driven technological advances in diagnostic techniques. From *ex vivo* DNA chip-analysis, to *in vivo* molecular imaging, the last decade has seen significant and continuing advances. We are developing new tools to investigate the correlation of molecular and developmental biological events in whole animals. We have developed FDA-approved, hand-held, electronic DNA and protein biosensors that are comprised of iron and ruthenium complexes. These reagentless devices are ideal for rapid, point-of-care diagnosis. *In vivo* molecular imaging has profoundly changed our understanding of biological events. Magnetic resonance imaging (MRI), a powerful experimental and clinical tool, offers a non-invasive means to map structure and function by sampling the amount, flow or environment of water protons *in vivo*. Intrinsic contrast can be augmented by the use of paramagnetic contrast agents. MRI is non-invasive and yields a true volume rendering of the subject with nearly cellular resolution. We directly observe developmental events in living embryos by labelling individual precursors with a microinjection of a stable, non-toxic, membrane impermeable MRI lineage tracer and tracking the descendants in an intact embryo. Temporal analysis of high-resolution, three-dimensional MR images enables the reconstruction of the cell divisions and movements responsible for any particular descendant(s). This technique allows the entire kinship relationships of a clone to be determined. The full potential of this technique requires a highly efficient means of delivering charged MR contrast agents. We have developed a library of molecular MR probes to elucidate signal transduction mechanisms of gene expression in whole animals. The modulation of fast water exchange with the paramagnetic centers of lanthanide chelates is triggered *in vivo* by enzymatic processing of the contrast agent or the reversible binding of an intracellular messenger, yielding distinct "strong" and "weak" relaxivity states.

10:40 a.m. Break (Refreshments Available)

11:00 a.m. Poster Session, Rose Street Concourse, Chemistry-Physics Building

12:00 p.m. Lunch, Conference Room (CP-137), Chemistry -Physics Building

1:30 p.m. Dr. Harry C. Dorn, Virginia Polytechnic Institute and State University
"Endofullerenes: New NanoProbes for Diag-

The encapsulation of metals and non-metals in fullerenes (endofullerenes) is providing new vistas in medical research. Endofullerenes, because of their shapes, capacity for multiple endo encapsulants, isolation from the bio-environment, and exo functionalizability, are ideal nano-constructs on which to engineer next generation diagnostic and therapeutic biomedical nanoprobes. In our VT CNC laboratory, we have reported a family of very stable metal endohedral metallofullerenes (EMFs), $A_{3-x}B_xN@C_{80}$ (x = 0-3, A, B = metals) that are formed via a trimetallic nitride template (TNT) process. To illustrate, recent *in vitro* and *in vivo* studies have demonstrated markedly enhanced ^1H MRI relaxivity (~2 orders of magnitude) for functionalized gadolinium EMFs in comparison with Gd-DTPA (Omniscan), a common commercially available clinical magnetic resonance imaging (MRI) contrast agent. In this presentation, we will describe the preparation, characterization, and potential medical applications of these new TNT EMF diagnostic and therapeutic nanoprobes.

2:40 p.m. Break (Refreshments Available)

3:00 p.m. Dr. Wenbin Lin, University of North Carolina at Chapel Hill
"Developing Hybrid Nanomaterials for Biomedical Imaging and Cancer Therapy"

Early diagnosis of diseases allows for more effective treatment, giving patients the greatest chance of survival and recovery. By harnessing the power of synthetic inorganic chemistry with that of the latest nanoscience and nanotechnology, the Lin group has developed new hybrid nanomaterials for multimodal imaging. These nanomaterials provide non-toxic and sensitive MRI and optical imaging probes for early and noninvasive detection of cancer and inflammatory arthritis in animal models, which potentially allows for the therapy to be initiated at the most treatable stage. The Lin group is also extending this powerful synthetic strategy to developing hybrid nanoparticles containing potent anticancer drugs. Such therapeutic nanomaterials can be selectively and more efficiently delivered to tumors than current chemotherapy, leading to reduced toxicity to normal cells and more effective cancer therapy.

4:10 p.m. Closing Remarks - Dr. John P. Selegue, Department of Chemistry, University of Kentucky

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

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

Thirty-Fourth Annual
Naff Symposium on

Chemistry & Molecular Biology

established in the memory of
Anna S. Naff

Inorganic Materials for Biomedical Imaging and Therapeutics

SPEAKERS

Thomas J. Meade
Harry C. Dorn
Wenbin Lin

Friday, April 4, 2008

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