



Biomedical nanomagnetism : A spin through new possibilities.

by Prof. Kannan M. Krishnan

Date: 30th January 2009 (Friday)

Time: 4:00pm to 6:00pm

Venue: LT 4

Abstract

Two of the principal challenges in biomedical nanoscience and personalized medicine are: a) the detection of disease at the earliest possible time prior to its ability to cause damage (diagnostics and imaging) and b) delivering treatment at the right place, at the right time whilst minimizing unnecessary exposure (targeted therapy with a triggered release). The former is dominated by optical methods, emerging "life on a chip" systems and the versatile magnetic resonance imaging technology. The latter remains an ongoing challenge.

In this context, we have been developing multifunction platforms for therapy, diagnostics and imaging based on functionalized, biocompatible, nanomagnetic molecular probes. Our work encompasses innovations in synthesis and functionalization, controlled self-assembly, advanced characterization, a wide-range of magnetic measurements and modeling to tailor their behavior for high moment or high frequency applications and carrying out cytotoxicity and biocompatibility studies. Currently, *in vitro* (magnetic separation and diagnostic relaxometry), *in vivo* (hyperthermia treatment of cancer, triggered drug delivery) and *imaging* (contrast enhancement in MRI and the development of a novel magnetic particle imaging microscope) applications are all being pursued.

This first part of the lecture will include an overview of nanotechnology, size-dependent magnetic behavior and the emerging field of biomedical nanomagnetism. This will be followed by a comprehensive discussion of our current work in these areas highlighting the fundamental principles behind our research in the context of emerging technological and clinical opportunities.

Prof. Kannan M. Krishnan Speaker

Kannan M. Krishnan received his B. Tech in Mechanical Engineering from IIT, Kanpur (India) in 1978, his MS in Materials Science from SUNY, Stony Brook in 1980 and his Ph.D in Materials Science from the University of California, Berkeley in 1984. He subsequently held various scientific and teaching positions at Lawrence Berkeley National Laboratory, UC Berkeley before joining the University of Washington, in 2001, as the Campbell Chair Professor of Materials Science and Adjunct Professor of Physics. He has also held visiting appointments at the Hitachi Central Research Laboratory (Japan), Tohoku University, Danish Technical University, University of Sao Paulo, University of Western Australia and Indian Institute of Science.

Prof. Krishnan is well recognized for both research and teaching. His many awards include the Guggenheim Fellowship (2004), the Rockefeller Bellagio Residency Fellowship (2008), the Burton Medal (Microscopy Society of America, 1992), Japanese Society for the Promotion of Science Senior Scientist Fellowship (2002), the University of Washington, College of Engineering Outstanding Educator Award (2004) and an appointment as the Professor-at-large at the University of Western Australia (2006-8). He is a Fellow of the American Association for the Advancement of Science and the Institute of Physics (London), and has served on the editorial boards of the Journal of Materials Science and Journal of Physics D: Applied Physics.

Prof. Krishnan's inter-disciplinary research interests are in magnetic nanostructures and thin film heterostructures, biomedical nanomagnetism, oxide spin electronics, advanced materials characterization and structure-property correlations at relevant length scales. All the projects are vertically integrated from the underlying science to their engineering (information storage, MEMS, magnetoelectronic devices) and biomedical (diagnostics, imaging and therapeutics) applications.

A/P Ding Jun Host

All are Welcome!