

R.I.T.

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Center for **IMAGING** SCIENCE

Seminar Series

Seeing is Believing: It's All About the Background

Thomas Meade

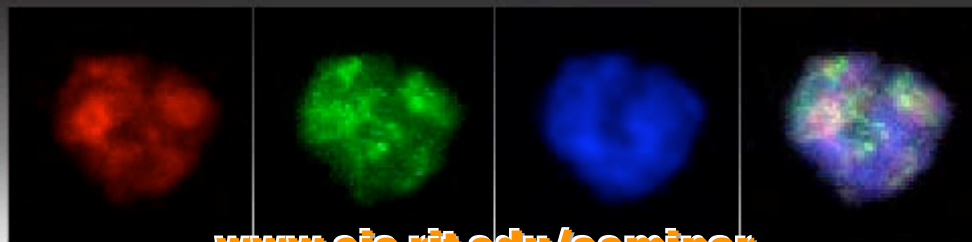
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Biochemistry and Molecular and Cell Biology, Neurobiology and
Physiology, and Radiology, Northwestern University*

4pm, Wed., Dec. 12, 2007

Auditorium of the Center for Imaging Science

Energy

To understand signal transduction mechanisms of gene expression in whole animals we have developed a library of molecular MR probes that are biochemically activated in-vivo. In this presentation we will review the fundamentals of MR imaging and MR contrast agents and will consider the impact recent advances in these area may promise for the experimental and clinical settings.



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Abstract

Fundamental biological and clinical questions have driven technological advances in an area of research known as biological molecular imaging. One technique is magnetic resonance imaging (MRI). MRI offers a non-invasive means to map structure and function by sampling the amount, flow or environment of water protons in vivo. Such intrinsic contrast can be augmented by the use of paramagnetic contrast agents. It is non-invasive and yields a true volume rendering of the subject with near cellular resolution (~10 microns).

The direct observation of ongoing developmental events in living embryos and the descendants of individual precursors in an intact embryo are labeled by microinjection of a stable, nontoxic, membrane impermeable MRI lineage tracers. Unlike previous methods, where labelled cells are identified at the termination of the experiment, this technique allows the entire kinship relationships of a clone to be determined. A highly efficient means of delivering charged MR contrast agents must be developed.

To understand signal transduction mechanisms of gene expression in whole animals we have developed a library of molecular MR probes that are biochemically activated in vivo. The lanthanide chelates modulate fast water exchange with the paramagnetic center, yielding distinct "strong" and "weak" relaxivity states. The modulation is triggered by two types of biological events: i. enzymatic processing of the contrast agent and, ii. the reversible binding of an intracellular messenger. In order to direct the intracellular uptake of these agents, we have prepared a number of small molecule "chaperones" that are covalently attached to the macrocyclic skeleton of the agent.

In this presentation we will review the fundamentals of MR imaging and MR contrast agents and will consider the impact recent advances in these area may promise for the experimental and clinical settings.

Speaker Bio

Thomas Meade, Ph.D., Received BS in Chemistry and his masters in Biochemistry and PhD in inorganic chemistry. After completing a NIH Postdoctoral fellowship at Harvard Medical School he was a postdoctoral fellow at the California Institute of Technology in the laboratory of Professor Harry B. Gray. In 1991 he joined the Division of Biology and the Beckman Institute at Caltech. In 2002 he moved to Northwestern University and is currently the Eileen Foell Chair in Cancer Research and Professor of Chemistry, Biochemistry and Molecular and Cell Biology, Neurobiology and Physiology, and Radiology. Professor Meade's research focuses on bioinorganic coordination chemistry and its application in research that include biological molecular imaging, electron transfer processes and the development of electronic biosensors for the detection of DNA and proteins. He has received numerous awards and founded three biotech companies, Clinical Micro Sensors, Metaprobe and Ohmx which are developing hand-held devices for protein and DNA detection and bioactivated MR contrast agents for clinical imaging of cancer.