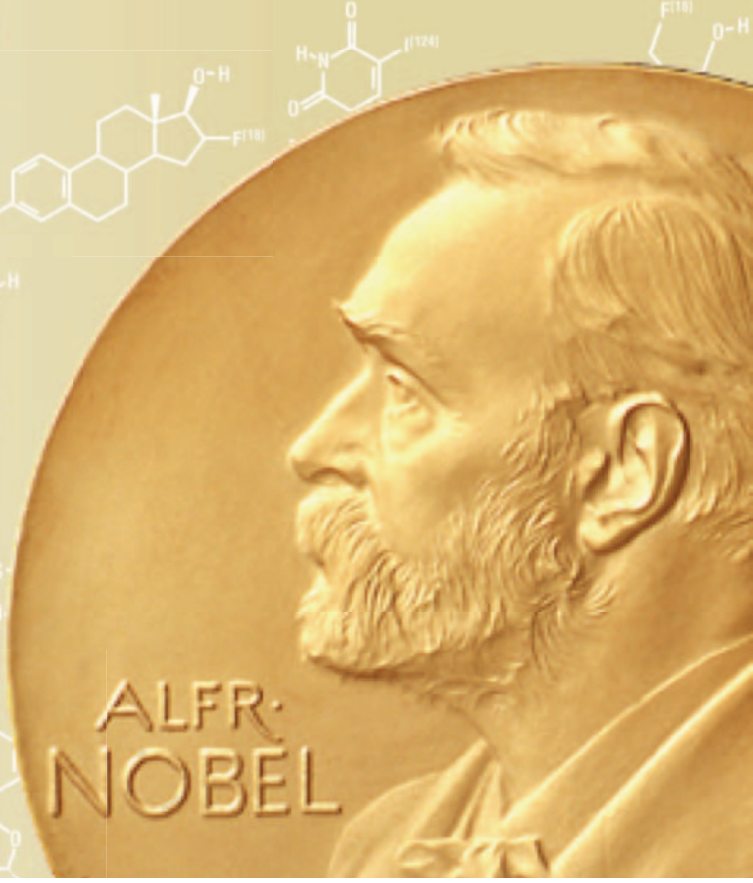
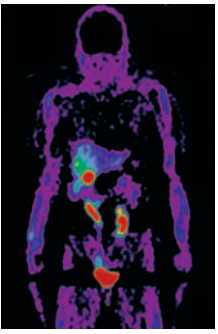
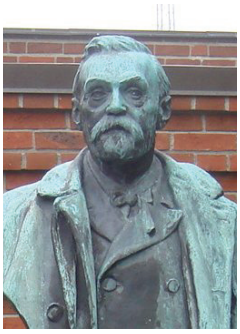
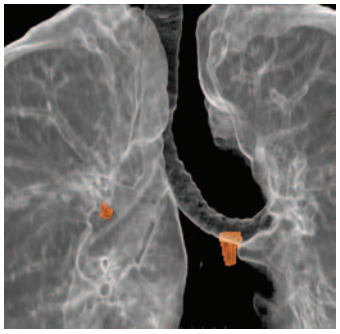
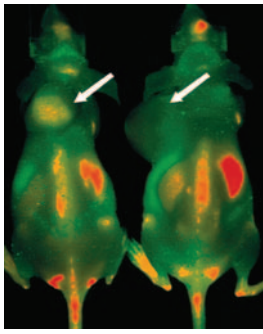
Watching Life Through Molecular Imaging











Nobel Conference

May 6 to 9, 2007

Nobel Forum
Karolinska Institutet, SE-17177
Stockholm, Sweden

Symposium Background

Morphological observations have driven the course of biology ever since the first microscope was built in the late sixteenth century. It would have been hard to conceive even a couple of decades ago, the extent to which progress would be made in observations of living subjects afforded by modern-day imaging techniques. Molecular imaging is the latest addition in this astounding imaging evolution, bringing observations in living subjects to a more meaningful dimension. For the first time molecular imaging is helping to shed new light on function in addition to structure in intact living subjects by way of novel approaches that visualize and characterize living biological systems at the cellular and even molecular levels.

Molecular imaging is a rapidly emerging biomedical research discipline that may be defined as the visual representation, characterization, and quantification of biological processes at the cellular and sub-cellular levels within intact living organisms. This is a novel multidisciplinary field, where the images produced reflect cellular and molecular pathways and in vivo mechanisms of disease present within the context of physiologically authentic environments. The term 'molecular imaging' implies the convergence of multiple image-capture techniques, basic cell/molecular biology, chemistry, pharmacology, medical physics, biomathematics and bioinformatics into a new imaging paradigm.

Current imaging technologies rely mostly on non-specific macroscopic physical, physiological or metabolic changes that differentiate pathological from normal tissue rather than identifying specific molecular events (e.g. gene expression) responsible for disease. Molecular imaging usually exploits specific molecular probes as the source of image contrast. This change in emphasis from a non-specific to a specific approach represents a significant paradigm shift, the impact of which is that imaging can now provide the potential for understanding of integrative biology, earlier detection and characterization of disease, and evaluation of treatment.

The emergence of molecular imaging strategies is largely due to recent unprecedented advances in molecular and cell biology techniques, the use of transgenic animal models, availability of newer imaging drugs and probes that are highly specific, and successful development of small-animal imaging instrumentation. These factors, along with continued expansion of scientific horizons in the current post-genomic era, have been pivotal in the drive toward a new standard that allows linking established in vitro and cell culture experimental assays to imaging studies within living subjects. This now creates the possibility of achieving several important goals in biomedical research, namely: (1) To develop non-invasive in vivo imaging methods that reflect specific cellular and molecular processes, e.g. gene expression, or more complex molecular interactions such as protein-protein interactions; (2) To monitor multiple molecular events near-simultaneously; (3) To follow trafficking and targeting of cells; (4) To optimize drug and gene therapy; (5) To image drug effects at a molecular and cellular level; (6) To assess disease progression at a molecular pathological level; and (7) To create the possibility of achieving all of the above goals of imaging in a rapid, reproducible, and quantitative manner, so as to be able to monitor time-dependent experimental, developmental, environmental, and therapeutic influences on gene products in the same animal or patient.

The timing is very appropriate for a symposium focused on the recent advances in the rapidly expanding field of molecular imaging. Advances in the field should lead to significant contributions in fundamental biology and the clinical management of cancer, neurological diseases, as well as many other disease states.

We gratefully appreciate the support of our sponsors

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Program Committee

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Markus Schwaiger, Universitätsklinikum Rechts von der Isar, Munich, Germany
Lars Terenius, Karolinska Institutet, Stockholm, Sweden
Ralph Weissleder, Harvard University, Boston, MA, USA

Sunday, May 6

Welcome and Introductory Remarks:
Sanjiv Sam Gambhir and Hans Ringertz

Opening Address:
Elias Zerhouni (National Institutes of Health)

Keynote Address: "Molecular Imaging with PET in Molecular Diagnostics and Molecular Therapeutics"
Michael Phelps (University of California, Los Angeles)

Monday, May 7

Advances in Molecular Imaging Instrumentation

"Molecular Imaging of Tissue Sections by Mass Spectrometry"
Per Andren (Uppsala University)

"Micro-ultrasound: From Anatomy to Molecules"
Stuart Foster (University of Toronto)

"New Dimensions in Real Molecular Imaging of Metabolism"
Klaes Golman (Inogal Apps)

"New Imaging Technologies to Enhance the Molecular Sensitivity of Positron Emission Tomography"
Craig Levin (Stanford University)

"Illuminating Systems Biology with Fluorescent Reporter Imaging"
Vasilis Ntziachristos (Harvard University)

"Morphology and Molecular Imaging: Combining Modalities"
David Townsend (University of Tennessee, Knoxville)

Novel Chemistry and Fundamental Assays for Interrogating Molecular Events

"Fluorescence Correlation Spectroscopy of Molecular Interactions in Living Cells"
Georgy Bakalkin (Karolinska Institutet)

"Amplification in Imaging of Molecular Diversity In Vivo"
Alex Bogdanov (University of Massachusetts)

"Imag(in)ing the Tumor Environment"
Robert Gillies (University of Arizona)

"Development of PET Chemistry and Tracers - The Tools for Molecular Imaging"
Bengt Langstrom (Uppsala University)

"Building Molecules to Spy on Cells and Tumors"
Roger Tsien (University of California, San Diego)

"PET Imaging Using Nonstandard Radionuclides"
Michael Welch (Washington University, St. Louis)

Tuesday, May 8

Imaging of Immune, Cancer, and Stem Cell Trafficking

"Observing Stem Cell Biology and Controlling Differentiation In Vivo"
Christopher Contag (Stanford University)

"Molecular-genetic Imaging In Diagnosis and Therapy of Cancer"
Juri Gelovani (University of Texas, Houston)

"Probing Cell Surfaces In Vivo Using ImmunoPET"
Anna Wu (University of California, Los Angeles)

"Combined Imaging and Blood Based Screening for Early Detection of Breast Cancer"
Kurt Zinn (University of Alabama, Birmingham)

"Imaging Protein Networks in Living Subjects"
Sanjiv Sam Gambhir (Stanford University)

Novel Approaches to Imaging Cancer in Humans

"Molecular Imaging for Treatment Response in Oncology"
Steven Larson (Memorial Sloan-Kettering Cancer Center)

"Integrating Proteomic Mapping and Molecular Imaging of Endothelium to Target Specific Organs and Solid Tumors"
Jan Schnitzer (Sidney Kimmel Cancer Center)

"Assessing Response to Therapy When it Still Matters: Early Therapy Monitoring by PET"
Markus Schwaiger (Universität München)

"Optical Imaging"
Ralph Weissleder (Harvard University)

"Molecular Imaging in Clinical Practice: Obstacles and Opportunities"
Hedvig Hricak (Memorial Sloan-Kettering Cancer Center)

Wednesday, May 9

Molecular Imaging of Cardiovascular Disease and Drug Efficacy

"Molecular Imaging at the National Institute of Biomedical Imaging and BioEngineering: Emerging Technologies"
Roderic Pettigrew (National Institutes of Health)

"Molecular Characterization of Atherosclerosis"
William Strauss (Memorial Sloan-Kettering Cancer Center)

"Imaging as a Key Enabling Tool in Drug Development"
Timothy McCarthy (Pfizer, Inc.)

"Molecular Imaging Readouts as Biomarkers for Treatment Efficacy and Mechanism of Action"
Markus Rudin (University of Zurich)

"Advancing Drug Discovery and Development with Molecular Imaging"
Nicholas van Bruggen (Genentech, Inc.)

Imaging the Normal Brain and Neurological Diseases

"A Probabilistic Atlas of the Human Brain: Quantifying Phenotypic Variance"
John Mazziotta (University of California, Los Angeles)

"Monitoring Brain Pathology and Neuronal Losses in Alzheimer's Disease"
Jorge Barrio (University of California, Los Angeles)

"Imaging Addiction in the Human Brain"
Joanna Fowler (Brookhaven National Lab)

"MRI Based Imaging Techniques: From the Lab Bench to Neurosurgical Practice"
Christoph Hofstetter (Cornell University)

"On the Search for Early Biomarkers in Transgenic Mouse Models for Alzheimer's Disease Using In Vivo ^{1}H-NMRS"
Christian Spenger (Karolinska Institutet)

Closing Remarks
Sanjiv Sam Gambhir and Hans Ringertz

***** Preliminary Program - Schedule subject to change *****

For more information, please contact Elizabeth Gill: 650 725-6175, eagill@stanford.edu or visit http://mips.stanford.edu/nobelconference

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