November 4, 2015
8:30-10:00am

MULTISCALE CHALLENGES IN BRAIN SCIENCES: Bridging Gaps in Knowledge and Understanding

Prof. Mark Ellisman, PhD

Distinguished Professor of Neurosciences and Bioengineering
Director, the National Center for Microscopy and Imaging Research
(NCMIR) (http://www.ncmir.ucsd.edu/) - and the Center for Research in
Biological Systems (http://crbs.ucsd.edu/) in La Jolla, California at the University
of California, San Diego.

Abstract:
A grand goal in neuroscience research is to understand how the interplay of
structural, chemical and electrical signals in and between cells of nervous tissue gives rise to behavior. We
are rapidly approaching this horizon as neuroscientists make use of an increasingly powerful arsenal of tools
and technologies for obtaining data, from the level of molecules to nervous systems, and engage in the
arduous and challenging process of adapting and assembling neuroscience data at all scales of resolution and
across disciplines. This talk will highlight projects in which development and application of new contrasting
methods and imaging tools have allowed us to observe otherwise hidden relationships between cellular,
subcellular and molecular constituents of nervous systems. Application to neurodegenerative diseases will be
described. New chemistries for carrying out correlated light and electron microscopy will be revealed, as well
as recent advances in large-scale high-resolution 3D reconstruction with TEM and SEM based methods.

Biography
Dr. Ellisman established National Center for Microsopy and Imaging Research in 1988 to achieve greater
understanding of the structure and function of the nervous system by developing 3D light and electron
microscopy methods. As a founding fellow of the American Institute of Medical and Biological Engineering, Dr.
Ellisman has received numerous awards including the Jacob Javits Neuroscience Investigatory Award from the
National Institutes of Health (NIH) and the Creativity Award from the National Science Foundation (NSF).

After earning a Ph.D. in molecular, cellular, and developmental biology from the University of Colorado,
Boulder, Dr. Ellisman began his tenure as a professor of neurosciences and bioengineering at UCSD in 1977.
He is also the interdisciplinary coordinator for the National Partnership for Advanced Computing Infrastructure
(NPACI) and leads NPACI's Neuroscience thrust, which involves integration of brain research and advanced
computing and communications technologies. In 2001, he founded the Biomedical Informatics Research
Network (BIRN), an NIH program that provides a multiscale imaging infrastructure linking major neuroimaging
centers around the country. In 2002, Dr. Ellisman was appointed to the National Advisory Council of the NIH
National Center for Research Resources (NCRR) and to the Physics Division Review Committee of the
Department of Energy, Los Alamos National Laboratory.

Dr. Ellisman's research promotes the development and application of advanced imaging technologies to obtain
new information about cell structure and function, structural correlates of nerve impulse conduction and axonal
transport, cellular interactions during nervous system regeneration, cellular mechanisms regulating transient
changes in cytoplasmic calcium, and aging in the central nervous system.

For additional details: http://ncmir.ucsd.edu/

November 5, 2015
8:30-10:00am

Molecular Imaging Endophenotypes in Dementia

Kirk A Frey, MD, PhD
David E Kuhl Professor of Nuclear Medicine in Radiology
Professor of Neurology
Senior Research Scientist, Molecular and Behavioral Neuroscience Institute
The University of Michigan

Abstract:
Dementia is a leading cause of health care expenditure, morbidity and mortality in developed nations throughout the world. Despite increasing understanding of molecular pathology in the major dementia syndromes, there has been limited progress in the discovery of new therapy; particularly lacking are effective disease-modifying treatments to slow or arrest neurodegeneration. Advances in molecular neuroimaging allow the non-invasive imaging of major dementia pathologies, and should permit improved diagnosis and classification of patients in therapeutic trials. Imaging of subjects early in the course of dementia syndromes has potential to reveal the cascade of events leading to behavioral symptoms and signs. In our laboratory, we have explored classifications of dementia patients according to the patterns of amyloid deposition and nigrostriatal projection integrity, identifying subgroups with Alzheimer disease (AD), dementia with Lewy bodies (DLB) and frontotemporal dementias (FTD). In a prospective study we determined a 35% discordance between clinical diagnostic classifications and the molecular image endophenotyping. Follow-up of subjects at autopsy confirms accuracy of the molecular imaging classifications. In a subset of subjects, additional clinical diagnostic imaging of cerebral glucose metabolism with [^{18}F]fluorodeoxyglucose (FDG) revealed discordant classification in a number of patients with an "FTD" FDG pattern, who were classified on molecular endophenotype imaging as AD, confirmed at autopsy. These findings, as well as emerging patterns and interactions among molecular imaging measures, suggest an important role for molecular neuroimaging in dementia at present and moving forward in the search for effective therapy.

Biography:
Kirk A Frey, MD, PhD is the David E Kuhl Collegiate Professor of Nuclear Medicine in Radiology, Professor of Neurology and Senior Research Professor in the Molecular and Behavioral Neuroscience Institute at The University of Michigan. He has served as the Program Director for Nuclear Medicine residency training at UM since 2004. Dr. Frey is Chief of the Division of Nuclear Medicine and Molecular Imaging, Director of the Center for Positron Tomography, and Co-Director of the Neurology Movement Disorders Clinic. He served recently on the Board of Directors of the American Board of Nuclear Medicine and on the Board of Directors of the American Board of Medical Specialties. He holds lifetime certifications from the American Board of Psychiatry and Neurology (Neurology, 1989) and the American Board of Nuclear Medicine (1989). He is an active participant in ABMS MOC. Dr. Frey has reported more than 195 peer-reviewed manuscripts and has held NIH grant support for over 30 years. He is a recipient of the Marc Tetalman Memorial Award and the Kuhl-Lassen Award from the Society of Nuclear Medicine and Molecular Imaging, is an elected member of the American Neurological Association and is a Distinguished Investigator in Academy of Radiology Research. His research interests focus on molecular imaging of neurodegenerations, including Parkinson disease, Alzheimer disease and related disorders.