Conference Keynote Lecture

Supported by partnership funds provided by Boston Scientific

"Use of New Nanotechnology-based DNA Sequencing Technologies to Illuminate Cellular Regulation and Defense"

Photo Credit: Stanford News Service

Andrew Zachary Fire, Ph.D.

Stanford University School of Medicine
Stanford, CA, USA

8:30
Friday, 4 September
Grand Ballroom – Salon D

Biographical Sketch

Andrew Zachary Fire received a B.A. in Mathematics from the University of California at Berkeley in 1978 and a Ph.D. in biology from the Massachusetts Institute of Technology in 1983. He became a staff member of the Carnegie Institute of Washington's Department of Embryology in Baltimore in 1986, where he began work on double-stranded RNA as a gene silencer. He was awarded the 2006 Nobel Prize for Physiology or Medicine, along with Craig C. Mello, for the discovery of RNA interference (RNAi), a mechanism in which genes are silenced by double-stranded RNA. Possible applications of RNAi include developing treatments for such diseases as AIDS, cancer, and hepatitis. Dr. Fire joined the faculty as a Professor of Pathology and Genetics at the Stanford University School of Medicine in 2003. His current research interests include the mechanisms by which cells and organisms respond to genetic change. These include mechanisms activated during normal development and systems for detecting and responding to foreign genetic activity. Much of the current effort in his lab at Stanford University is directed toward a molecular understanding of the RNAi machinery and its roles in the cell. Throughout his career, all of the major work in Dr. Fire's labs has been supported by research grants from the U.S. National Institutes of Health. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences, and serves on the Board of Scientific Counselors and the National Center for Biotechnology, National Institutes of Health.

Plenary Lecture

"The History of Short-Term and Long-Term Pacing"

Earl E. Bakken, M.D. Hon.

Medtronic, Inc.
Minneapolis, MN, USA

19:40
Thursday, 3 September, (Welcome Banquet)
Grand Ballroom

Abstract

There are differing opinions on when cardiac pacing actually started. Dr. Bakken differentiates between short-term and long-term pacing and gives an account of his experience with the evolution of pacemaker development, from the 1st battery-powered portable pacemaker developed in coordination with Dr. C. Walton Lillihei at the University of Minnesota, through his historic invention of the first wearable, battery-operated, transistorized pacemaker, and includes a crucial component that enabled pacing to take the leap from short-term to long-term. That component was the bipolar electrode, developed by Dr. Sam Hunter and Medtronic Engineer Norman Roth. Dr. Bakken gives an engaging chronology of the history of this monumental era in the relationship of medicine and engineering through his eyes as the founder of Medtronic, Inc.

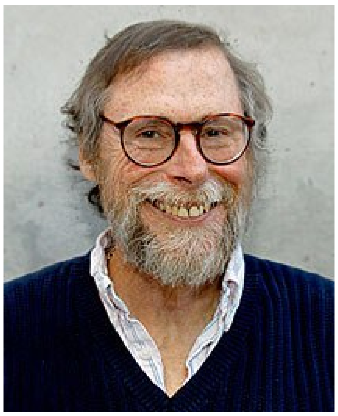
Biographical Sketch

In 1949, Earl Bakken co-founded Medtronic, one of the world's leading developers and manufacturers of therapeutic medical devices, as a partnership with the late Palmer J. Hermundslie. Bakken was Medtronic's chief executive officer and chairman of the board from the company's incorporation in 1957 until 1976. He was senior chairman of the board through 1989 and retired from the board in August 1994. Bakken remains actively involved in Medtronic company relationships. After earning a Bachelor of Science in Electrical Engineering in 1948, he studied electrical engineering with a minor in mathematics at the University of Minnesota Graduate School. Bakken developed the first wearable, external, battery-powered, transistorized pacemaker in 1957 for Dr. C. Walton Lillehei, a University of Minnesota heart surgeon. In 1975, Bakken founded The Bakken, a nonprofit library museum and educational center devoted to the history of electricity and magnetism and their use in medicine and life sciences. Earl Bakken has received a number of awards and honorary doctor's degrees, in recognition of his pioneering contribution to implantable cardiac pacemaker and therapeutic medical devices. Dr. Bakken received IEEE Eli Lilly Award in Medical and Biological Engineering in 1994 for pioneering development and commercialization of implantable cardiac pacemakers, and shared the National Academy of Engineering's 2001 Fritz J. and Dolores H. Russ Prize, with Wilson Greatbatch, for their independent development of the implantable cardiac pacemaker. Dr. Bakken is a member of National Academy of Engineering, a Fellow of IEEE and Instrument Society of America, and an Honorary Fellow of AIMBE, ACC, BMES, International College of Surgeons, and Heart Rhythm Society.

Plenary Lecture

Supported by partnership funds provided by the
Department of Biomedical Engineering, University of Minnesota

"MR Imaging of Brain Function: Challenges, Opportunities and Questions"



Gary H. Glover, Ph.D.

Stanford University
Stanford, CA, USA

8:30
Thursday, 3 September
Grand Ballroom – Salon D

Abstract
Since its inception in 1991, functional Magnetic Resonance Imaging (fMRI) has been the object of intense research by a diverse community that includes imaging physicists, biomedical engineers, statisticians, neurobiologists, cognitive neuroscientists, clinical researchers and clinicians. fMRI uses rapid imaging to repeatedly scan a subject's brain while he/she performs a cognitive task or lies quietly, and, because the signals are small, statistical analyses that determine the likelihood that a given brain region is involved in the process of interest. The signals result from changes in blood oxygenation due to altered local brain metabolism, with a concomitant change in the magnetic state of the blood's hemoglobin. Creating MR imaging methods that are sensitive to these subtle changes while avoiding artifacts has required the solution of many engineering challenges. While fMRI is in widespread use for applications in the neurosciences as well as clinical care, there remain opportunities for further improvements in the acquisition of data and the time series analysis of the resulting thousands of images.

The broad availability of fMRI and the apparent simplicity with which it may be applied to a large range of studies of the brain has fostered the recent inception of applications in the social sciences as well as biosciences, e.g. in economics (neuromarketing), lie detection, psychoanalysis and many others. Some of these applications have raised ethical questions for which answers are unclear.

In this talk I will review the basics of fMRI, some of the remaining engineering challenges and emerging applications, its potential use as biofeedback for therapy and some of its misuses.

Biographical Sketch
Gary H. Glover received his BS, MS, and PhD in Electrical Engineering from the University of Minnesota. He is a Professor of Radiology, Neurosciences and Biophysics, and, by courtesy, Electrical Engineering and Psychology, and is Director of the Radiological Sciences Lab at Stanford University. His research interests have been in medical imaging for nearly 35 years, and presently encompass the physics and mathematics of imaging with Magnetic Resonance. He has over 50 issued U.S. Patents and has published over 300 publications in the field of medical imaging. Dr. Glover has won the Gold Medal from the International Society for Magnetic Resonance in Medicine (ISMRM) and the Outstanding Researcher Award from the Radiological Society of North America (RSNA). He is a member of the National Academy of Engineering.

Dr. Glover is a Fellow of ISMRM and AIMBE and has served as the President of ISMRM. He has served on numerous advisory committees and editorial boards. Currently he is a member of the Editorial Boards for Magnetic Resonance in Medicine, the Journal of Magnetic Resonance Imaging (JMRI) and Current Medical Imaging Reviews. He is a member of the National Advisory Council of the National Institute of Biomedical Imaging and Bioengineering of the NIH.

Plenary Lecture

Supported by partnership funds provided by the
Institute for Engineering in Medicine, University of Minnesota

"Biological Engineering & Systems Biology – New Opportunities for Engineers in Biotech/Pharma Industry"

Douglas A. Lauffenburger, Ph.D.

Massachusetts Institute of Technology
Cambridge, MA, USA

8:30
Saturday, 5 September
Grand Ballroom – Salon D

Abstract
The consecutive life science revolutions of molecular biology and genomic biology have led to the promise for improving human health by molecular-level interventions -- but the accompanying challenge of doing so in a rational, predictive manner. Addressing this challenge, and meeting this promise, requires understanding of complex biological processes with molecular detail but in integrative fashion; the emerging field aimed at this endeavor is now commonly termed 'systems biology'. In many ways, this field is an ideal application area for the biological engineering discipline, and offers tremendous opportunities for biology-based engineers. This talk will present a view of key aspects of this vision, along with example application vignettes.

Biographical Sketch
Douglas A. Lauffenburger is an Uncas & Helen Whitaker Professor of Bioengineering and Head of the Department of Biological Engineering at the Massachusetts Institute of Technology, and also hold appointments in the Departments of Biology and Chemical Engineering. He is a member of the Biotechnology Process Engineering Center, the Center for Biomedical Engineering, the Center for Cancer Research, and the Center for Environmental Health Sciences. He also serves on the Steering Committee of the Computational & Systems Biology Initiative.

Dr. Lauffenburger has served as a consultant or scientific advisory board member for the Burroughs-Wellcome Fund, the Whitaker Foundation, and many biomedical companies. A few of his awards include the Pierre Galletti Award, the W.H. Walker Award, and the Distinguished Lecture Award from BMES. He is a member of the National Academy of Engineering and of the American Academy of Arts & Sciences, and has served as President of the Biomedical Engineering Society. Dr. Lauffenburger's major research interests are in cell engineering: the fusion of engineering with molecular cell biology. A central focus of his research program is in receptor-mediated cell communication and intracellular signal transduction, with emphasis on development of predictive computational models derived from quantitative experimental studies, for cell cue/signal/response relationships important in pathophysiology with application to drug discovery and development.