NIBIB Workshop on

DEFINING THE STATE-OF-THE-ART IN BIOMEDICAL IMAGING:
RESEARCH NEEDS FOR THE FUTURE

TOPICAL SESSION DESCRIPTIONS

Session 1: Image Acquisition – Sources and Sensors
Dr. Thomas Brady – MGH

Medical imaging systems sense radiation reflected by, transmitted through, or emitted by the patient's body. Sensor or detector characteristics are often the limiting factors with regard to gathering the information necessary for medical purposes. This session will survey the major types of sensors used in different medical imaging modalities, discuss applicable sources or radiation, and identify areas in which improvements in sensor and source characteristics could have major benefits in heathcare and the field of biomedical imaging.

Session 2: Image Acquisition – Targeted Agents
Dr. Henry Wagner – JHU

A class of pharmaceuticals called targeted agents are used to either produce or increase the contrast of biologically-significant components in the body. The ultimate aim of this effort is true imaging at the molecular level in which specific biological molecules are targeted for imaging purposes. This session will survey the field of targeted agents, identify limitations of current pharmaceuticals, and suggest directions for future research.

Session 3: Data Reconstruction, Interpretation, and Informatics
Dr. Maryellen Giger – UChicago

Medical imaging is inextricably linked to computer science and informatics in that large quantities of data must be stored, managed, and analyzed. These data often must be transformed by computer from its raw form (i.e., tomographic projections) to a form usable by the diagnostician (i.e., a 3-D image). After the data is in a suitable form, further computer applications are necessary to assist in the diagnostic process. This session will assess the capabilities and limitations of current computer hardware and software all along the imaging informatics chain, and will identify important needs for future research and development to advance the field.

Session 4: Data Evaluation and Objective Assessment of Image Quality
  Dr. Bruce Davis – NASA

Medical and research images are acquired for specific purposes or tasks, and a meaningful evaluation of image quality must take into account how well the task is performed. This need has resulted in an important aspect of biomedical imaging in which tools and principles of statistical decision theory are applied to objective assessment of image quality.   This effort encompasses such topics as receiver operating characteristic (ROC) analysis, model observers, and statistical modeling. This session will survey the statistical decision theory approach to medical imaging, identify unsolved problems with related methodologies, and recommend future research needed to address the problems.

Session 5: Emerging Technologies and Applications
  Dr. Ron Price – Vanderbilt

The most significant advances in biomedical imaging often are associated with identifying new signals that convey information about biological function or applying new technologies that allow more precise measurement of known signals. Also, several applications of imaging technologies show significant promise for the future in areas associated with biomedical research or healthcare. This session will focus on emerging technologies and potential biomedical applications that need to be considered in the future.