

Therapeutic Ultrasound

The use of ultrasound in medicine is now quite commonplace, especially with the recent introduction of small, portable and relatively inexpensive, hand-held diagnostic imaging devices. Moreover, ultrasound has expanded beyond the imaging realm, with methods and applications extending to novel therapeutic and surgical uses. These applications broadly include: Tissue ablation, acoustocautery, body contouring, site-specific and ultrasound mediated drug activity, extracorporeal lithotripsy, and the enhancement of natural physiological functions such as wound healing and tissue regeneration. A particularly attractive aspect of this technology is that diagnostic and therapeutic systems can be combined to produce totally non-invasive, image-guided therapy. This general lecture will review a number of these exciting new applications of ultrasound and address some of the basic scientific questions and future challenges in developing these methods and technologies for general use in our society. We shall particularly emphasize the use of High Intensity Focused Ultrasound (HIFU) in the treatment of benign and malignant tumors as well as the introduction of acoustic hemostasis, especially in organs which are difficult to treat using conventional medical and surgical techniques. A review of the various clinical applications of HIFU will also be presented, as well as the existing challenges to broad clinical acceptance of this technology.

Biographies:

Dr. Lawrence A. Crum is currently Principal Physicist in the Applied Physics Laboratory and Research Professor of Bioengineering and Electrical Engineering at the University of Washington. He has held previous positions at Harvard University, the U. S. Naval Academy and the University of Mississippi, where he was F. A. P. Barnard Distinguished Professor of Physics and Director of the National Center for Physical Acoustics. He has published over 300 articles in professional journals, holds an honorary doctorate from the Universite Libre de Bruxelles, and was recently awarded the Helmholtz-Rayleigh Silver Medal of the Acoustical Society of America. He is Past President of the Acoustical Society of America, the World Council on Ultrasonics, and of the Board of the International Commission for Acoustics.

Dr. Joo Ha Hwang is currently an Assistant Professor in the Department of Medicine, Division of Gastroenterology at the University of Washington in Seattle. He holds adjunct appointments in the Departments of Bioengineering and Radiology. He is an NIH funded researcher with active grants on HIFU vascular bioeffects and drug delivery. In addition, he is an active clinician with board certification in Internal Medicine with subspecialty board certification in Gastroenterology. He is an interventional endoscopist, primarily performing endoscopic ultrasound for diagnosis and staging of gastrointestinal malignancies (e.g., pancreatic cancer, esophageal cancer, cholangiocarcinoma, gastric cancer, and colorectal cancer). He received his M.D. from the University of Chicago and his Ph.D. in Bioengineering from the University of Washington. He is currently a board member of the International Society of Therapeutic Ultrasound.

Michael R. Bailey is a Senior Research Engineer in the Applied Physics Laboratory and has pending joint appointments in the Mechanical Engineering and Urology Departments. His education was at Yale and the University of Texas with a summer project at the University of Rochester. He was awarded the R. Bruce Lindsay (Young Investigator) award of the Acoustical Society of America (ASA) and the Frederic L. Lizzi Early Career Award of the International Society of Therapeutic Ultrasound (ISTU). He the former chair of the Biomedical Ultrasound technical committee of the ASA, a board member of ISTU, and a member of the Bioeffects Committee of the American Institute for Ultrasound in Medicine (AIUM).