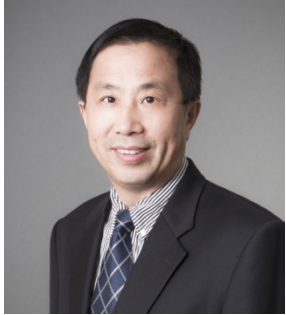


1:00pm-5:00pm | Oct 21, 2015 (Wednesday)

2F

Title:	High frequency ultrasonic transducers – materials, design and performance
Lecturer:	Qifa Zhou , Viterbi School of Engineering, University of Southern California, Los Angeles, CA, USA Sandy Cochran , Institute for Medical Science and Technology, University of Dundee, Dundee, UK
Abstract:	<p>Piezoelectric ultrasound transducers are used in most contemporary ultrasound systems, applications including biomedical therapy and imaging, nondestructive evaluation, and underwater sonar. A topic of particular current interest is microultrasound, based on devices and related systems working at higher operating frequencies, and therefore able to deliver higher spatial resolution than more conventional approaches. The content of this course will relate particularly to applications in biomedical imaging.</p> <p>The course will begin with topics that provide understanding of the fundamentals of piezoelectric materials and their use in ultrasound transducers, and will then focus on microultrasound topics in the frequency range from 30 MHz upwards. Ceramic, single crystal, polymer and thin film piezoelectric materials will be introduced, including characteristics describing their physical properties and behavior, with an explanation of the physics underlying these descriptions. Materials such as the recent piezocrystals will be compared with longer established materials, with a focus on the thin sections required for high frequency operation.</p> <p>Specific discussion of microultrasound will cover the basic structures of single-element ultrasound transducers and arrays and related fabrication processes, noting how they must be modified for the miniature dimensions required for microultrasound. A similar approach will be taken with instrumentation, extending conventional practice at lower frequencies to those above 30 MHz. The course will finally focus on case studies in devices made with piezocrystals and piezoelectric thin films, with illustrative results.</p>
Outline	<ul style="list-style-type: none">• Definition of the high frequency ultrasound range for biomedical imaging• Piezoelectric material fundamentals for high frequency operation• Ultrasonic transducer and array fundamentals for high frequency operation• Necessary ancillary components in piezoelectric transducers and systems• Device and system fabrication processes for high frequency operation• Case studies in piezocrystals and thin films
Biography	



Qifa Zhou's research focuses on the design and fabrication of high frequency ultrasonic transducers using new piezoelectric single crystal and thin film technologies for medical imaging applications. He has integrated ultrasonic technology with advanced optical technology for intravascular imaging application. His current work is to develop miniaturized photoacoustic imaging (PA) probes using high frequency ultrasound transducers for endoscopic application. The primary motivations are to overcome the depth limitation of existing endoscopic imaging technologies and to provide functional information for disease states via photoacoustic imaging.



Sandy Cochran's carries out research in the area of medical ultrasound devices, with applications in imaging, diagnosis and therapy. He is presently leading a programme on ultrasound capsule endoscopy, with a particular focus on microultrasound devices and miniature electronics. He also maintains interests in relevant materials, fabrication techniques and systems design for medical and life sciences applications. The applications of his work are in high resolution characterization of tissue and pathology in various organs of the body, notably relating to cancer and to the gastrointestinal tract.