8:00am-12:00pm | Oct 21, 2015 (Wednesday)

1F

Title:	**Medical Ultrasound Probes: Transducers and Electronics**
Lecturer:	**David M.J. Cowell,** University of Leeds, Leeds, UK, **L. Scott Smith,** GE Global Research, Niskayuna, NY, USA
Abstract:	Ultrasound has grown to be the most commonly performed medical imaging procedure in the world because it is fast, safe, portable, and inexpensive. This course will provide an introduction to ultrasound probes emphasizing a system's perspective; how the probe's acoustic and electrical characteristics contribute to overall system performance. Starting from an overview of the basic types of phased-array transducers (linear, convex, sector), we will show how the probe's design is derived from its target application. We will describe how engineering tools, like equivalent-circuit, finite-element, and acoustic field models, can be used to predict transducer performance accurately, and then to optimize the design. A discussion of transducer structure will lead to an overview of typical fabrication processes. We will describe the role of probe electronic components, including cables, tuning networks, multiplexers, and partial beamforming, to enhance signal to noise as well as enable new imaging capabilities. The design and specifications of front end circuitry, both transmitters and receivers will be addressed. Methods for evaluating completed transducers will be described. The course will mention recent developments in probe technology, including single crystal piezoelectrics, cMUT transducers, catheters, 2D arrays, and wireless probes and provide connections to relevant talks at the conference and publications for further study.

Biography

David M.J. Cowell gained his PhD from the School of Electronic and Electrical Engineering at the University of Leeds in 2008 working with the Ultrasound Group. His doctoral research area was advanced coding excitation techniques and excitation circuit design for industrial instrumentation and medical imaging systems. During this time he has performed extensive consultancy in instrumentation, FPGA and high-speed digital hardware design. After working as a research consultant in measurement and instrumentation, he joined the Ultrasound Group as a Research Fellow. His main research interests are focused on the design of high frame rate ultrasound systems for both medical and industrial applications, advanced ultrasound excitation systems with low harmonic distortion for phased array imaging and signal processing for process measurement.

L. Scott Smith is a physicist at GE Global Research. He earned B.S. and Ph.D. degrees in physics from the University of Rochester and the University of Pennsylvania respectively. Joining GE in 1976, he developed phased array probes for medical ultrasound. More recently, he contributed to or led projects on adaptive acoustics, volumetric imaging probes, and additive manufacturing for ultrasound probes. Dr. Smith has 56 issued patents and over 40 refereed publications. He is a member of the American Physical Society and a Senior Member of the IEEE where he serves as an Associate Editor for the Transactions on UFFC, and on this symposium's Technical Program Committee. He has been a short course instructor at this symposium for over ten years and especially enjoys teaching and talking with students new to the field.