

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

# 1A

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| <b>Title:</b>    | <b>Ultrasonic Imaging Systems: from Principles to Implementation</b>  |
| <b>Lecturer:</b> | <b>Kai E Thomenius</b> , Massachusetts Institute of Technology, USA   |
| <b>Abstract:</b> | The design of medical ultrasound imagers has been undergoing important changes brought about by advances in semiconductor and signal/image processing technologies. These are having an impact on medical practice and utilization of medical imaging in general. Unique aspects of raw data acquisition and processing in the ultrasound scanner enable opportunities unavailable to other imaging modalities; key one of these is miniaturization. The goal of this course is to review system design of ultrasound scanners from a linear systems point of view including transduction, beamformation, and image formation and their evolution. The key points to be covered deal with methods of analysis of array data, the interaction of transmit and receive beams with clinically relevant targets, and how this interaction is used in the generation of clinically useful images. Last decade has seen a steady migration of system functionality from hardware to software. Most significantly, processor speeds and data transfer rates have reached the point where the beamformation function can now be done within a processor. Not only has this permitted further miniaturization; it also opens up the possibility of highly innovative new means for image formation. Early investigations into this more reconstruction-oriented image formation will be discussed. |
| <b>Outline</b>   | <ul style="list-style-type: none"><li>• Ultrasound imager as a linear system</li><li>• Impact of developments in microelectronics on imager components</li><li>• Resulting changes in imagers and their clinical application</li><li>• Software beamformation approaches</li></ul>  |

## Biography



**Kai E. Thomenius** is currently a Visiting Scientist at the Institute of Medical Engineering and Science in MIT, Cambridge, MA. Until recently, he was a Chief Technologist in Diagnostics & Biomedical Technologies at General Electric Global Research in Niskayuna, NY, USA. Previously, he has held senior R&D roles at ATL Ultrasound Inc. (now Philips Healthcare), Interspec Inc., Elscint Inc., as well as other companies. In addition, he has been an Adjunct Professor in the Electrical, Computer, and Systems Engineering Department at Rensselaer Polytechnic Institute. Dr. Thomenius' academic background is in electrical engineering with a minor in physiology with degrees from Rutgers University. His long-term interests have been in beamformation and miniaturization of scanners, propagation of acoustic waves in inhomogeneous media, delivery and drugs and DNA to cells, and gaining physiological information from echoes that arise from acoustic beams. Dr. Thomenius is a Fellow of the American Institute of Ultrasound in Medicine.