

A Primer on Ultrasound for Neuroergonomics

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Abstract / Short description

This workshop is designed to provide a basic understanding of ultrasound as a non-invasive and safe modality for imaging, such as functional imaging using transcranial Doppler, and treating the brain. Ultrasound is incredibly versatile, and this workshop will also touch on neuromodulation methods. In reviewing acoustic wave propagation and the fundamentals of transduction basic ultrasound instrumentation, utilization, evaluation, and regulation will be discussed. This will provide the background for optimizing treatment, while ensuring safety and efficacy. Physical parameters, such as pressure amplitude, frequency, rate of delivery and focusing will be introduced along with the relationship to potential mechanisms of action. Examples of both pre-clinical and clinical imaging and neuromodulation will be presented. Finally, the most recent advances in ultrasound-assisted clinical treatment of Parkinson's and Alzheimer's disease will be reviewed.

Keywords

Ultrasound-assisted neurostimulation, Focused Ultrasound Stimulation (FUS), Transcranial Doppler (TCD) Ultrasound, Physiological measurement, Brain therapy

Tentative Schedule for a 3–4-hour session Tuesday, July 9th am.

Ultrasound in neurostimulation – chair: Dr. Mark E. Schafer and Dr. Peter A. Lewin	
8:00 am	Welcome and introduction
8:15 am	Basic principles, Instruments, Setup
9:00 am	Imaging
9:45 am	Stimulation
10:30 am	Pre-clinical and clinical examples
11:00 am	Conclusion – what's next - final Q&A

CVs:

Mark E. Schafer, Ph.D. has had an extensive leadership career in the medical device industry, with hands-on development and program management experience from R&D through regulatory and commercialization. He is an internationally recognized expert in medical ultrasound, including design, development, intellectual property, regulatory, and applications. He has been a serial entrepreneur and is a named inventor on over 38 patents. He is a Fellow of the American Institute of Ultrasound in Medicine, the Acoustical Society of America, the American Institute for Biological and Medical Engineering, and the Ultrasonic Industry Association. After a thirty-five-year career as an entrepreneur, consultant, and business leader, he was recently appointed Research Professor at the Drexel University School of Biomedical Engineering, Science, and Health Systems. His current efforts at Drexel include NIH-funded research into cardiac output measurement using piezopolymer ultrasonic catheters, as well as novel ultrasound sources for neuro-stimulation.

Peter A. Lewin, M.Sc., Ph.D. is R.B. Beard Distinguished University Professor of Electrical and Computer Engineering and Director of the Ultrasound Research and Education Center in The School of Bioengineering, Bioscience and Health Systems at Drexel University. Dr. Lewin was awarded several

patents in the field of ultrasound and has authored or co-authored 250 scientific publications, most of them on topics in ultrasound and is co-editor of *Ultrasonic Exposimetry* (CRC Press, 1993), a landmark book in the field. He is globally recognized as one of the leading authorities in the biomedical applications of ultrasound and was elected Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE). He is also a Fellow of the American Institute of Ultrasound in Medicine (AIUM), Acoustical Society of America (ASA), American Institute for Medical and Biological Engineering (AIMBE) and Elected Fellow of International Academy for Medical and Biomedical Engineering (IAMBE). In addition, he is Fellow of the College of Physicians in Philadelphia. He serves as a consultant to the U.S. Food and Drug Administration, Center for Devices and Radiological Health and received the highest recognition as a Distinguished Advocate and Fellow from The American Institute for Medical and Biological Engineering (AIMBE) for seminal contributions to the field of ultrasonics and development of new piezoelectric transducers and measurement methods. Most recently, he completed his Secretary of Health appointment as a member of the NIH Advisory Council.