BIOENGINEERING
Spring 2019 Seminar

Date: Thursday, February 28, 2019
Time: 12:00 pm - 1:00pm
Location: Krasnow, Room K229

Peter Basser, Ph.D.

Biography: **Peter J. Basser, Ph.D. is a scientist-inventor whose work has transformed how neurological disorders and diseases are diagnosed and treated, and how brain architecture, organization, structure, and anatomical "connectivity" are studied and visualized. He is the principal inventor of Diffusion Tensor Magnetic Resonance Imaging (DTI)—a non-invasive MRI technology that yields a family of novel features and imaging biomarkers. Quantities that he proposed include the mean apparent diffusion coefficient (mADC)—a DTI-derived parameter widely used to follow changes in stroke and cancer, and the fractional anisotropy (FA), a robust quantity that makes brain white matter visible to radiologists and neuroscientists. He also proposed and developed "Streamline Tractography", a means to elaborate white matter pathways, which now helps neuroradiologists plan brain surgeries. More recently, Dr. Basser has been a pioneer in the field of "Microstructure Imaging", which uses MRI data and models of water diffusion in tissue to extract salient micron-scale morphological features. Examples of MRI methods Dr. Basser invented and developed with colleagues include the non-invasive measurement of the mean axon diameter (CHARMED), the axon diameter distribution (AxCaliber), and the mean apparent propagator (MAP) in each voxel. He and members of his lab have also been actively involved in developing multiple pulsed-field gradient (mPFG) methods to measure microscopic diffusion anisotropy, which they reported observing in gray matter as early as 2007. Within the past few years, Dr. Basser's lab has continued to make important contributions in neuroimaging, inventing and developing MRI methods to measure and map joint relaxation and diffusion spectra in brain tissue.**

Dr. Basser received his undergraduate and graduate training in Engineering Sciences at Harvard University and his post-doctoral training in the Intramural Research Program (IRP) of the National Institutes of Health in Bethesda, MD. Currently, he is a Principal Investigator and Associate Scientific Director within the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development

Title: **Probing tissue microstructure and dynamics non-invasively with MRI**

Abstract: **MRI provides unique ways to probe tissue microstructure, architecture and organization non-invasively and in vivo. Although the MRI voxel size is on the order of 1 mm x 1 mm x 1 mm, it is possible to interrogate transport processes, such as water diffusion, and relaxation and exchange processes occurring on much finer length scales – on the order of microns. Studies done in our lab at the NIH and elsewhere show that we are able to measure water diffusion profiles within the living brain, and determine microstructural details, such as axon diameter distributions along white matter pathways.**

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