

# Bioengineering Department



## Spring Seminar

Location: Research Hall 163

Date: March 31

Time: 12:30pm-1:30pm

Dr. Weinberg received a PhD in experimental plasma physics at UC Irvine in 1989, learning how to store and deliver hundreds of thousands of amps in millionths of seconds. After attending a talk by Dr. Michael Phelps (the PET scanner developer, not the swimmer) about functional brain imaging, Dr. Weinberg decided to spend time as a postdoc in biomedical engineering at UCLA. After waiting six months for a pending job offer in Los Angeles as a medical physicist, he was given 24 hours to decide whether to attend medical school in Miami and so he started driving East. The medical physics job offer came one week later. Three years later, as a resident in diagnostic radiology at Johns Hopkins, Dr. Weinberg told his mammography supervisor (Dr. Rachel Brem, now Director of Breast Imaging at GWU) that "there must be a better way". Dr. Brem told him to feel free to go ahead and find one, so Dr. Weinberg founded a company that built the first PET scanner dedicated to breast imaging. He subsequently was involved in founding six other companies that have made FDA-approved medical products used by one million Americans. Dr. Weinberg continues to see patients as a radiological consultant. Since 2008, Dr. Weinberg has run an incubator in Rockville, MD that has spun off four companies in the fields of medical imaging and image-guided therapy, working with investigators at University of Maryland, Children's National Medical Center, Georgetown University, Wayne State University, UC Irvine, and the University of Valencia.



# Irving Weinberg, MD PhD

President, Weinberg Medical Physics LLC, Bethesda, MD

Topic: Ultra-fast MRI and Image-guided Therapy with Magnetic Particles



MRI systems work because excited protons radiate energy at frequencies that depend on the local magnetic field strength. As a result, the spatial and timing resolution of MRI scanners is related to the spatial and timing gradient of the local magnetic field. Early MRI manufacturers noticed that if the magnetic gradients were too high and too fast, patients started to get uncomfortably stimulated, like Galvani's frogs and Dr. Frankenstein's creature. As a result of these early MRI studies, the FDA decided in 1978 to impose limits on slew rates (i.e., magnetic change in time and space) so that magnetic fields would not be changed so quickly as to cause discomfort. In 2006, Dr. Weinberg took a contrarian hypothesis: perhaps the gradients were not being changed fast enough? Working with Dr. Stanley Fricke at Children's National Medical Center, he showed (in a prospectively-designed controlled clinical trial) that slew rates thousands of times higher than FDA's limits could be applied without bio-effects, if the magnetic field changes were made in less than 10 microseconds. Three companies have been launched to take advantage of the high resolution and speed made available with this innovation. Dr. Weinberg is evaluating in animal studies whether the same high and fast magnetic fields can be deployed to propel and image custom-made magnetic particles in tissues, for potential research and therapeutic applications in cancer, neurology, and otology.