The William G. Lowrie Department of Chemical and Biomolecular Engineering

Cordially invites you to attend a seminar on

**In Vivo Quantitative Imaging of Nanoparticles and Cells Using Magnetic Particle Imaging**

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**Bio**

Carlos M. Rinaldi-Ramos is the Chair and Dean’s Leadership Professor in the Department of Chemical Engineering and Professor in the J. Crayton Pruitt Family Department of Biomedical Engineering at the University of Florida. He received his bachelor’s degree in Chemical Engineering at the University of Puerto Rico, Mayagüez, and completed degrees in Master of Science in Chemical Engineering, Master of Science in Chemical Engineering Practice, and Doctor of Philosophy in Chemical Engineering at the Massachusetts Institute of Technology. Prior to the University of Florida, Dr. Rinaldi-Ramos was a Professor in the Department of Chemical Engineering at the University of Puerto Rico, Mayagüez (UPRM). While at UPRM, Dr. Rinaldi-Ramos collaborated with Dr. Oscar Perales Perez on several projects resulting in major instrumentation infrastructure, education and research opportunities for students, and joint publications. Dr. Rinaldi-Ramos’s research spans synthesis and characterization of magnetic nanoparticles for biomedical applications and evaluation of nanoparticle transport and diffusion in biological fluids. Current efforts focus on developing tracers for magnetic particle imaging (MPI), an exciting new biomedical imaging modality that allows for non-invasive, unambiguous, and quantitative imaging of the in vivo distribution of superparamagnetic iron oxide nanoparticle tracers.

**Carlos Rinaldi-Ramos**

*Dean’s Leadership Professor and Chair of Chemical Engineering*

*Department of Chemical Engineering and J. Crayton Pruitt Family Department of Biomedical Engineering*

*University of Florida*

**Monday, February 28, 11:30 AM**

**Virtual Webinar**

**Abstract**

Magnetic Particle Imaging (MPI) is a new molecular imaging technology capable of unambiguous and quantitative tomographic imaging of the distribution of superparamagnetic nanoparticle tracers *in vivo*. While the term MPI may be confused with that for Magnetic Resonance Imaging (MRI), the two rely on distinct physics. In MPI, a tomographic image of the distribution of superparamagnetic nanoparticles is constructed by scanning a so-called field free region (FFR) through the domain of interest. Outside the FFR there is a quasi-static bias field strong enough to saturate the magnetic moments of the nanoparticles. But inside the FFR the dipole moments of the nanoparticles respond to the superimposed alternating excitation field. The signal used to construct an image in MPI arises due to the non-linear dynamic magnetization response of the nanoparticle dipole moments to the excitation field inside the FFR. At the field amplitudes and frequencies used in MPI there is no appreciable attenuation in field or signal strength in tissue. Further, while there are magnetic species in the body (e.g., ferritin), they do not contribute an appreciable signal for MPI, allowing for unambiguous imaging of the distribution of one of the superparamagnetic nanoparticle tracers. In this talk I will explain the physics of image generation in MPI, discuss work to understand how imaging performance relates to physical and magnetic properties of the nanoparticles, and discuss our work developing tracers and using MPI to quantify biodistribution of iron oxide nanoparticles *in vivo*, in the context of tracking nanoparticles and cell therapies.

Please click the link below to join the webinar:

<https://osu.zoom.us/j/92533497495?pwd=dk4rRERBS2xsZ09xSjJJNVF6TkF1QT09>

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