BIOENGINEERING
Fall 2019 Seminar

Date: Thursday, November 14, 2019
Time: 12:00 pm - 1:00pm
Location: Exploratory Hall, Room L111
(*Videoconferencing to SciTech, K. Johnson Hall Rm 254)*

Daniel Turnbull, Ph.D.

Biography: Daniel H. Turnbull received his Ph.D. from the Department of Medical Biophysics at the University of Toronto in 1991. After postdoctoral work on high-frequency ultrasound (HFU) for clinical skin imaging, he became a faculty member at the Skirball Institute of the New York University School of Medicine in 1994, where he is currently a Professor of Radiology, Pathology and Electrical & Computer Engineering. For the past 25 years, the Turnbull lab has focused on developing and applying HFU and MRI methods for studying brain development and disease in mice, from early embryonic to adult stages. They are currently focused on developing imaging-based pipeline approaches for high-throughput in vivo analysis of brain defects in a variety of mouse mutants .

Title: Imaging the developing mouse brain: Morphology to molecules

Abstract: Genetically-engineered mice are currently being generated in many laboratories for in vivo studies of brain development and a wide range of neurodevelopmental diseases. Indeed, defined mutant mice have been critical for identifying the affected genetic pathways and addressing the underlying cellular and molecular basis of developmental brain diseases including hypoplasia syndromes, autism spectrum disorders (ASD) and pediatric brain tumors. To aid in this research, we have established in vivo magnetic resonance imaging (MRI) and high frequency ultrasound (HFU) approaches for analyzing the developing mouse brain from early embryonic to adult stages. The resulting imaging methods and 4D data are now providing a quantitative framework for understanding the morphogenesis of the mouse brain. In combination with biologically-relevant contrast agents such as paramagnetic manganese (Mn), we have gained important new insights into the early postnatal development of brain structure and function. Mn-enhanced MRI (MEMRI) approaches are being employed to characterize brain growth and patterning in normal mice and in mutants with both proliferation and cerebellar foliation defects. In this talk, I will focus on applications of MEMRI to mouse developmental disease models, including medulloblastoma, the most common malignant brain tumor in children, and Niemann-Pick Type C, a rare metabolic disorder that causes neuro-degeneration in children. I will also discuss our ongoing studies to develop reporter systems for molecular MRI, including the divalent metal transporter, DMT1, which transports Mn (and other divalent metals) into cells. As we acquire 4D imaging data on molecular/cellular and morphological changes in the developing mouse brain, we aim to provide a more quantitative, multi-scale view of mouse brain development, from morphology to molecules.