A major theme in this arena is to advance understanding of the physiology and biomechanics of acute respiratory failure and its treatment by mechanical ventilation so as to devise new therapeutic strategies related to these problems.

**John Marini, M.D.**, Professor of Medicine

**Optimizing Mechanical Ventilation after Acute Lung Injury:** Our lab is focused on determining how to minimize iatrogenic damage and speed recovery in acute lung injury. We are currently examining the chronology, adaptive processes, and co-interventions that influence the development of ventilator-induced lung injury; and the effectiveness of specific ventilatory patterns in optimizing regional and global lung recruitment. Our approach includes mathematical modeling of ventilation of the normal and damaged lung. Our team of investigators includes David Dries (Professor of Surgery), and Alex Adams and is facilitated by collaborations with Dr. Perry Leo (Professor of BioEngineering), and a mathematician from Vanderbilt University (Philip Crooke). This program has attracted many accomplished international visitors for sabbaticals of up to two years duration, including Drs. David Tuxen (Australia), Paulo Pelosi (Italy), Marcelo Amato (Brazil), and Lluis Blanch (Spain).

**Victor Barocas, PhD**, Professor of Biomedical Engineering, Director of Graduate Studies

**Computational Biomechanics and Transport.** My group wants to understand how biotransport processes are governed by mechanical, physical and chemical phenomena. Specific areas of interest include: ocular biomechanics of aqueous humor flow (and implications for drug delivery); effects of biopolymer matrices on cell behavior (including in artificial bio-tissues); and the role of micropumps and use of microtechnology. I collaborate with Angela Mortari in studies of bioartificial lung reactors for repopulation of matrices with human stem cells to create functioning lungs.

**Saurav Paul PhD, MS, JD**, Director, Innovation Fellows Program, Medical Device Center

**Medical Device Development.** My background is in biomedical engineering, with expertise in fluid and bio-mechanics, and in product liability law. I worked for nine years at St Jude Medical developing minimally invasive catheter platforms for diagnosis and treatment of atrial fibrillation. I now lead the Innovation Fellows Program, training MDs and engineers to develop new devices that solve clinical problems working jointly with clinicians, engineers and industry. The Medical Devices Center is a new interdisciplinary program in the Institute of Engineering in Medicine – a joint initiative of the Institute of Technology and Medical School. The Center’s goals are to train medical device inventors and to promote multidisciplinary research.