June 13, 2016

Dear members of the Hajim School community:

It's time to catch up on some of the latest research accomplishments of our faculty members.

Andrew Berger, Associate Professor of Optics, and **Hani Awad**, Professor of Biomedical Engineering, have **received a $1.88 million, five-year grant** from the National Institutes of Health for their project, "Raman Spectroscopic Platform for Transcutaneous Monitoring of Bone Quality." Currently, assessing the risk of bone fracture associated with osteoporosis relies primarily on measures of bone mineral density. These measurements are strongly correlated with bone strength, but not with fracture risk. The goal of this grant is to **demonstrate Raman spectroscopy as a promising, noninvasive way to assess both bone strength and fracture risk, and to also detect improvements in bone quality in response to anti-resorptive and anabolic treatments**. This is an exciting project, with important applications as our population continues to age. Interestingly, this five-year collaboration between Andrew and Hani **started with a Provost Multidisciplinary Award** in 2010, which yielded five high profile publications and led to a prior R21 grant from the NIH, which has now culminated in this large MPI R01 award. As Hani notes, **the return on that $75,000 in seed money** initially invested in this project through the Provost award **is now in excess of $2.25 million** in NIH funding.

Speaking of Provost Multidisciplinary Awards, they are now called **University Research Awards -- and several of our faculty members have been announced as recipients this year**, either as individual researchers or as members of interdisciplinary teams. As mentioned above, the awards provide seed money on a competitive basis **for innovative research projects that are likely to attract external support** when sufficiently developed.

For example, **Marvin Doyley**, Associate Professor of Electrical and Computer Engineering, is **working with two of the teams that received awards**. He is collaborating with Vyacheslav Korshunov of Medicine on **high throughput analyses of pathological arterial remodeling in genetically manipulated or pharmacologically treated mice** in hopes of producing new therapeutic approaches for treating cardiovascular and cerebrovascular diseases. He is also working with George J. Schwartz and Jeffery M. Purkerson of Pediatrics to **better understand how excess acid in the blood (acidosis) damages the kidney** and also whether acute correction of the acidosis with sodium bicarbonate therapy can reverse the acid-induced increases in kidney stiffness, calcium excretion, and inflammation.

Danielle Benoit, Associate Professor of Biomedical Engineering, is working with Rudi Fasan of Chemistry and Benjamin Frisch of Medicine on a **novel nanoparticle-based system to deliver antileukemic agents to acute myeloid leukemia and leukemia stem cells within the bone marrow,** in hopes of improving what is now a poor overall survival rate associated with this hematological cancer.

Jannick Rolland, the Brian J. Thompson Professor of Optical Engineering, and Research Associate **Patrice Tankam** of her group are working with Amy Kiernan and Holly Hindman of Ophthalmology on using a combined micron-class optical coherence microscopy and fluorescence microscopy **to identify potential stem cells and to better understand cell turnover and injury recovery in the corneal endothelium**, whose failure contributes significantly to 30,000 corneal transplants in the U.S. each year.

Associate Professor **Catherine Kuo**, and Assistant Professor **Mark Buckley** of Biomedical Engineeering are working with Natasha O'Malley of Orthopaedics to develop **novel *in vitro* and *in vivo* experimental models to investigate the role of aberrant mechanical loading of embryonic tendons in the development of clubfoot**. Their goal is to motivate novel prevention or treatment strategies for nearly 200,000 babies born with clubfoot each year.

John Marciante, Associate Professor of Optics, received an award to **demonstrate visible lasing using special optical fibers**, which has applications for **artificial guidestars for adaptive optical astronomical imaging (yellow) and digital laser cinema (green)**. His group has developed a proprietary method to overcome obstacles that have hindered direct visible emission from solid-state lasers for the last half century.

Nick Vamivakas, Assistant Professor of Quantum Optics and Quantum Physics, will **develop a proof-of-principle demonstration using an ordinary digital camera to measure an ultrafast optical pulse** -- an example of how quantum concepts can inform classical optics in new and unexpected ways.

As always, keep me updated and have a great week!

Robert L. Clark
Professor and Dean