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Center for Biomedical Engineering and Technology - University of Maryland School of Medicine
in conjunction with the Fischell Department of Bioengineering, School of Engineering, University of Maryland, College Park

Summer Celebration

Left to right, back row: Ian Qian, Viraj Desai*, Gibran Nasir, Duncan Woodbury, Nathaniel Dirda.

Front row: Dr. W. Jonathan Lederer, Lauren Querido*, Christine O'Keefe*, Ahsal Major, Yasmin Kadry*, Siddarth Plakkot*, SOM Dean E. Albert Reece.

*Denotes a Fischell Department of Bioengineering student.



BIOMET SCIENTIFIC PROGRAMS

LABORATORY OF
MOLECULAR CARDIOLOGY

LABORATORY OF
NANOBIOLGY

LABORATORY FOR
NEURODEGENERATIVE DISEASES

LABORATORY FOR
PRION DISEASES

PROGRAM IN
CANCER BIOLOGY

PROGRAM IN
CELL STRUCTURE AND
DEVELOPMENT

PROGRAM IN
MITOCHONDRIAL DYNAMICS

Given the record number of summer interns at BioMET this year (*BioMET Now*, Vol. 14, No. 3), it seemed fitting to celebrate and find out more about the projects on which the students had worked. So on August 1, the students, their mentors and dignitaries from both UM campuses came together for lunch and presentations. BioMET had the honor of hosting UM President Dr. Jay Perman, along with Chief Academic and Research Officer, Senior Vice-President and Dean of the Graduate School Dr. Bruce Jarrell. The School of Medicine was represented by Vice President for Medical Affairs, University of Maryland; the John Z. and Akiko K. Bowers Distinguished Professor, and Dean of the School of Medicine Dr. E. Albert Reece and Richard Pierson III, MD, Senior Associate Dean for Academic Affairs. Fischell Department Chair Dr. William Bentley was also present. The students were extremely gratified that Dr. Robert Fischell also attended.

Each student received a certificate presented by SOM Dean Reece, and photographs were taken with the Dean and their mentors. After lunch, each student gave a brief presentation on the work they had done over the summer. The presentations elicited much interest and many comments. Dr. Fischell in particular was enthusiastic in critiquing and commenting on the presentations. Since the students ranged from high school to rising college seniors, the consistent quality of the presentations were a tribute to the students' hard work, as well as to excellent mentoring. BioMET faculty members were one in agreeing that the quality of interns was extremely high this year and are looking forward to next year. BioMET will again recruit interns from the Fischell Department. Below is a list of interns, their mentors and their projects (*denotes students from the Fischell Department):

*Yasmin Kadry, Dr. Ilia Baskakov, "Generation of Mammalian Prions in vitro"

*Lauren Querido, Drs. George Williams and W. Jonathan Lederer, "Modeling Type-2 Inositol 1,4,5-Triphosphate Receptor"

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UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

The University of Maryland Medical Center (UMMC) was once again ranked among the nation's top-rated hospitals in the annual U.S. News and World Report's Best Hospitals rankings. Rankings were up in numerous specialty categories. BioMET congratulates UMMC for its continued excellence.

Congratulations to the Clark School of Engineering on being ranked 14th in the annual Academic Ranking of World Universities poll.

More X-ROS

In a follow-up article to the *Science* article announcing a new signaling pathway in heart muscle called X-ROS (*BioMET Now* Vol 14, No 5), Dr. Lederer and his colleagues extended the work to skeletal muscle. The work was published in *Science Signaling* in August (Khairallah, R.J., Shi, G., Sbrana, F., Prosser, B. L.,

Borrito, C., Mazaitis, M.J., Hoffman, E.P., Mahurkar, A., Sachs, F., Sun, Y., Chen, Y.-W., Raiteri, R., Lederer, W. J., Dorsey, S. G., Ward, C. W. 2012. "Microtubules Underlie Dysfunction in Duchenne Muscular Dystrophy." *Science Signaling* 5, ra56). The work demonstrates that the dysfunction in the skeletal muscles in Duchenne's muscular dystrophy (DMD) also involves the X-ROS pathway, just as for the heart. Both studies utilized a mouse model of DMD. By antagonizing the microtubule network or inhibiting the X-ROS pathway, muscle damage could be lessened. The work has the potential for new therapies in DMD, which has no known cure. The publication included the cover of the issue.

The work merited an Editor's Choice note in the August 24th issue of *Science Magazine*. The UM web page also featured the new work. It can be found at <http://www.umaryland.edu/offices/communications/news/?ViewStatus=FullArticle&articleIDetail=19015>.

The X-ROS pathway links the mechanical action of cellular contraction to calcium signaling, the basis for the electrical signal that triggers cellular contraction. The fact that the pathway utilizes reactive oxygen species (ROS) was a total surprise to investigators.

This opens many new pathways of investigation, as well as new opportunities for drug targeting.



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It's Official! BioMET is SOM

After over two years of waiting, BioMET is now formally organized research center in the School of Medicine. The Executive Committee recommended accepting BioMET as their June meeting with the full acceptance by the SOM June 19, 2012.

Moving Up in the World

BioMET has two new Assistant Professors, though not two new faces. Former Research Associate Dr. Guiling Zhao (right) was promoted to Assistant Professor, non-tenure track, in the Department of Physiology. She is funded by an AHA Scientist Development Award. Postdoctoral Fellow Dr. Ben Prosser (below) was also promoted to Assistant Professor, non-tenure track in the same department. He is funded by an NIH K99 Award also aimed at developing young scientists.

Dr. Zhao received her PhD from Southern Medical University in Guangzhou, China in 2003. After teaching there for a couple of years, she left for a postdoctoral position in the Department of Physiology at the University of Tennessee Health Science Center in Memphis. She moved to Dr. W. Jonathan Lederer's laboratory as a Research Associate in 2009. Her work centers on gated calcium channels, called IP_3 receptors in arial cells. These channels are sensitive to voltage changes during contraction. In 2010, Dr. Zhao received a Scientist Development Awards from the American Heart Association. The award is designed to help young scientists to become independent.

Baltimorean Dr. Ben Prosser did his undergraduate work at Wake Forest University, then came back to Baltimore to do his graduate work here at the University of Maryland. His thesis advisor was Dr. Martin Schneider, a well-known muscle biologist. After receiving his PhD in 2009, he joined Dr. W. Jonathan Lederer's laboratory at BioMET.



His research got off to a roaring start, culminating in a patent issued this year and a first-author article in *Science* (*BioMET* Now Vol 14, No 5) on X-ROS last year. This work was also the foundation of his NIH Pathway to Independence Award (K99/R01). His proposal received the highest score possible (10) and was funded in July. The award is given to postdoctoral fellows who are poised to become highly productive independent researchers. Generally, the first two years are mentored and the remaining three years are totally independent, with the expectation that the awardee will be in a tenure-track faculty position by that time. Dr. Prosser's appointment to a non-tenure track faculty position is just an early step towards that goal.

As noted above, while funding is not the only criteria for promotion, it is one that has become more significant in recent years. It is one measure of the potential of young scientists. If they can garner funding now, then the likelihood they will be able to do so in the future is increased. This becomes important for getting tenure-track positions.

CELEBRATION, CONTINUED

in Heart"

*Christien O'Keefe, Drs. Saleet Jafri and W. Jonathan Lederer, "Modeling Neuronal Growth Cones"

*Siddarth Plakkot, Dr. Mariusz Karbowski, "Polymerization of Actin on Mitochondria in Apoptosis"

*Viraj Desai, "Dr. Bruce Vogel, "The Role of Hemicentin in Proprioceptions
Ahsal Major, Dr. Shengyun Fang, "NanoLuc as a Reporter for Monitoring Mutant CFTR Degradation"

Ian Qian, Dr. Shengyun Fang, "Observing Ubiquitination in Live Cells"

Nathaniel Dirda, Dr. Joseph Kao, "Enhancing 2-Photon Cross-Section of Photolabile Caged Glutamate"

Gibran Nasir, Dr. Joseph Kao, "A Sensor for Imaging Cardiac Calcium Signaling *in Vivo*"

Duncan Woodbury, Dr. Joseph Kao, "Carotenoid Antioxidants for Use in Cellular Physiology"

The topics demonstrate the wide range of interests of BioMET faculty members.

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e SOM Execu-
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BIOMET HAPPENINGS

Comings and Goings

Daryl E. Butler has joined the Baskakov laboratory as a Research Specialist.

Publications

Khairallah RJ, Shi G, Sbrana F, **Prosser BL**, Borroto C, Mazaitis MJ, Hoffman EP, Mahurkar A, Sachs F, Sun Y, Chen YW, Raiteri R, **Lederer WJ**, Dorsey SG, Ward CW. Microtubules underlie dysfunction in duchenne muscular dystrophy. *Sci Signal*. 2012 Aug 7;5(236):ra56.

Lee YJ, **Baskakov IV**. The cellular form of the prion protein is involved in controlling cell cycle dynamics, self-renewal, and the fate of human embryonic stem cell differentiation. *J Neurochem*. 2012 Aug 6. [Epub ahead of print]

Gonzalez-Montalban N, **Baskakov IV**. Assessment of Strain-Specific PrP(Sc) Elongation Rates Revealed a Transformation of PrP(Sc) Properties during Protein Misfolding Cyclic Amplification. *PLoS One*. 2012;7(7):e41210. Epub 2012 Jul 17.

Chen Z, Du S, **Fang S**. gp78: a multifaceted ubiquitin ligase that integrates a unique protein degradation pathway from the endoplasmic reticulum. *Curr Protein Pept Sci*. 2012 Jul 18. [Epub ahead of print]

Zhong Y, **Fang S**. Live cell imaging of protein dislocation from the endoplasmic reticulum. *J Biol Chem*. 2012 Aug 10;287(33):28057-66.

Hagen BM, Boyman L, **Kao JP**, **Lederer WJ**. A comparative assessment of fluo Ca(2+) indicators in rat ventricular myocytes. *Cell Calcium*. 2012 Aug;52(2):170-81.

Makarava N, **Baskakov IV**. Genesis of transmissible protein states via deformed templating. *Prion*. 2012 Jul 1;6(3):252-5.

Grants and Contracts

Awards

Dr. Ilia Baskakov, 6/15/12, NIH, "Self-propagating mechanism of prion diseases," \$441,719, yr 1 of 5.

Dr. Guiling Zhao, 7/1/12, AHA, "IP3RI activates Ca²⁺-activated K⁺ channel through direct couplin in arterial smooth muscle cells," \$77,000, yr 3 of 4.

Dr. Ilia Baskakov, 8/1/12, NIH, "Elucidating molecular structure of mammalian prions," \$359,890, yr 1 of 5.

Dr. Benjamin Prosser, 8/20/12, NIH, "Stretch-dependent X-ROS signaling: implications for cardiomyopathy," \$134,730, yr 1 of 5.

Submissions

Dr. Mariusz Karbowski, 7/5/12, NIH, "Control of mitochondrial proteostasis by AAA-ATPase p97," Total Request: \$1,918,750.

Dr. Joseph Kao, 8/1/12, TEDCO, "Contrast Agents for Electron Paramagnetic Resonance Imaging," \$50,000.

Talks and Travels

Dr. W. Jonathan Lederer, Annual Meeting of the Advisory Board of the Totman Trust, Burlington, Vermont, 7/17/12.

Dr. W. Jonathan Lederer, Invited Speaker, "X-ROS Signaling in Heart," American Heart Association, Basic Cardiovascular Sciences 2012 Scientific Sessions: Frontiers in Cardiovascular Science and Novel Therapy, New Orleans, LA, July 24, 2012.

MPower Update

Editor's Note: While BioMET may not participate in all activities relating to the new initiative, the success of the entire enterprise benefits everyone. Thus, all activities of the new initiative will be highlighted in BioMET Now. As before, all members of the BioMET community are encouraged to look at the MPower web site at mpowermaryland.com for current information.

While Mpowering initiatives are still in their early stages, the idea of linking the two major campuses in the University of Maryland System has prompted a number of other collaborative programs, for example BioMET's intern program. The latest one is a first for the School of Medicine. The UM School of Medicine, along with the Medical Center, will participate in the Capstone program at the Fischell Department of Bioengineering at the University of Maryland College Park. This year-long program for seniors is an opportunity to apply their textbook learning to real-world problems. The results have been impressive over the years, including spinning out companies and products. More information is available at <http://www.umaryland.edu/offices/communications/news/?ViewStatus=FullArticle&articleDetail=19038>.

Several BioMET faculty members have been involved in the Capstone program in previous years.

Moving Update

Progress continues to be made on the new space for BioMET. The design process for the Pharmacy Building Space went into high gear, since that is the easier part of the process. Final design documents are needed by the early fall, but many details have to be finalized before then. Since each investigator has slightly different needs and different equipment that must be accommodated, even the placement of electrical plugs are critical. Just the equipment needs alone runs to hundreds of pages of specifications. Every iteration of the plans is checked and re-checked by Assistant Director Brian Hockenberry, Facilities Manager Mike McCrea, and the individual investigator. Given the very short time line and limited budget, mistakes would be costly.

While the Pharmacy Building moves into the final design and construction phase, the General Research Building where the rest of the faculty and administration will be housed has been assigned an architect. Preliminary designs had already been produced, so the new architects just need to get up to speed.

BioMET should know by the early fall when the expected move-in to Pharmacy will take place.

Dr. Benjamin Prosser, invited speaker, "Stretch, redox, and arrhythmogenesis," European Society of Cardiology Congress 2012, Munich, Germany, August 26, 2012.