



UNIVERSITY OF MARYLAND  
SCHOOL OF MEDICINE

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Inside:

- Meeting Schedule
- Guest Speakers
- College Park Visitors
- Photos from the Meeting



# BioMET

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

## Retreat Undampened by Drizzly Weather

April showers may be great for flowers, but a few minutes in the sunshine can make a big difference when most of the day is spent in a room without windows. However, the array of scientific talent and the addition of some special visitors made up for the uncooperative weather at the Ninth Annual Retreat, albeit the second as BioMET.

The retreat retained its successful program of mixing short talks from each laboratory with longer talks from outside speakers. This year had the added complication of a university-wide lecture by Nobel Prize winner, Dr. Carol Greider scheduled for 4:30 pm. However, by shortening the breaks and lunch, the retreat ended at 3:45, time enough for participants to head back down town. Since the weather was uninviting, shorter breaks were tolerated.

The tighter schedule was maintained by BioMET Acting Director, Dr. W. Jonathan Lederer, who opened the retreat just before 9 am. The first speaker was Dr. Nuria Gonzales-Montalban from Dr. Ilia Baskakov's laboratory who spoke on how prion strains can be generated. The Baskakov laboratory is a world leader in prion biology, and Dr. Gonzales-Montalban came from Spain to work there. She was followed by our first outside speaker, Dr. Iris Lindberg.

continued page 3

BioMET  
Scientific Programs

Laboratory of  
Molecular Cardiology

Laboratory of  
Nanobiology

Laboratory for  
Neurodegenerative Diseases

Laboratory for  
Prion Diseases

Program in  
Cancer Biology

Program in  
Cell Structure and Development

Program in  
Mitochondrial Dynamics

## Distinguished Visitor

The Retreat has entertained many distinguished visitors over the years, but the faculty and staff were particularly gratified that the Dean of the University of Maryland School of Medicine (UMSOM) could join them for the afternoon sessions. UMSOM Dean E. Albert Reece, MD PhD MBA is an accomplished scientist studying the molecular mechanisms of diabetes-induced birth defects. Pregnancy induced diabetes is a significant health concern, whose etiology is not well understood.

Dean Reece was not the only visiting dignitary. Dr. Meredith Bond, chair of the Department of Physiology, came for the morning sessions. Most of BioMET faculty members have their academic home in her department.

Dean Reece, right, with  
BioMET Acting Director,  
Dr. W. Jonathan Lederer,  
left.



## Guest Speakers

Each year, BioMET invites colleagues to talk about their work. The faculty suggest current collaborators, possible collaborators, or scientists whose work is timely and interesting. BioMET has contacts throughout UMB and across the university system. This year's guests represent an excellent cross-section of the breadth of talent with whom BioMET faculty interact.

### Iris Lindberg

Professor, UMB

*Invited by Dr. Iliia Baskakov*

Large inactive precursor molecules are converted to smaller bioactive species through the actions of enzymes known as proprotein convertases (PCs). These highly specific processing enzymes, which operate within the secretory pathway, are critical to the maturation of many types of membrane-bound and secreted molecules. One example is the synthesis of the opioid peptide met-enkephalin, accomplished primarily by the convertase PC2. Our work takes a variety of approaches to the study of proprotein convertases, from the study of purified proteins to experiments in whole animals. Each approach offers a different level of experimental control and yields a different kind of information.

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## Meeting

Time	Presenter	
8:00-8:50am		Arrival
8:50-9:00	W. Jonathan Lederer	Welcome
9:00-9:20	Nuria Gonzalez-Montalban (Baskakov Laboratory)	Mutating' a protein
9:20-10:00	Iris Lindberg (Anatomy & Neurobiology, UMB)	Blocking protease potential secret
10:00-10:30		
10:30-10:50	Shengyun Fang	Does SVIP func
10:50-11:10	Valeria Albornoz (Monteiro Laboratory)	Regulation of u
11:10-11:50	Shuwei Li (Chemistry & Biochemistry, UMCP)	Revival of Deu
11:50-1:05		
1:05-1:25	Mariusz Karbowski	AAA-ATPase p
1:25-1:45	Aristide Chikando (Lederer Laboratory)	Mitochondrial
1:45-2:25	Brian Polster (Anesthesiology, UMB)	Reversible inhi O2
2:25-3:05		
3:05-3:25	Bruce Vogel	From Worms to
3:25-3:45	Joseph Kao	Mis/Adventure

## College Park Guests

One of BioMET's long term partners at College Park has been Dr. Silvia Muro of the Fischell Department of Bioengineering. Dr. Muro had been expected to attend the BioMET retreat, as she has for several years. However, she was a finalist for an prestigious award at the Experimental Biology meeting in Washington, D.C. and could not make it. In her stead, she sent two members of her laboratory, Dr. Viraj Mane (right) and Biomedical Engineering graduate student,

Janet Hsu (center). Both Dr. Mane and Ms. Hsu were enthusiastic in their comments about the retreat: "We will definitely encourage others to come next year. The science has been fantastic."

They are shown talking to Dr. Joe Kao (left), a collaborator of Dr. Muro's, and the closing speaker for this year's retreat.



Dr.  
She  
Fan

# Schedule

Title
al/Continental Breakfast
on strain in vitro through a change in prion amplification environ-
in aggregation in the secretory pathway:7B2 and proSAAS as secretory chaperones
Break (30 min)
ction as a switch from ERAD to autophagy?
ubiquilin function in cells
terium-Labeled Reagents for Quantitative Proteomics
Lunch (75 min)
97 is a critical factor for mitochondrial proteostasis
Dynamic Calcium Signaling in Heart
hibition of mitochondrial complex II by nitric oxide at physiological
Break (30min)
o Mice: Modeling Cellular Processes
s with Caged Molecules

## Shuwei Li

Assistant Professor, UMCP

Invited by Dr. Shengyun Fang

My laboratory is interested in studying in vivo functions of protein tyrosine phosphatases (PTPs) with a wide range of techniques, including synthetic chemistry, molecular biology, protein biochemistry, and proteomic tools. We will develop novel chemical approaches that can detect, inhibit, or trap a specific PTP from its native milieu. These methods will not only help us to investigate physiological roles of PTPs in cellular signal transduction and their defects in various diseases, but also provide new tools for identification of novel targets for drug discovery.

## Brian Polster

Assistant Professor, UMB

Invited by Dr. Mariusz Karbowski

Limiting damage to mitochondria is crucial for neuroprotection. My research focuses on understanding the basic subcellular mechanisms that govern neural cell death and survival in neurodegenerative disorders. My investigations center on two key pathways of injury, apoptotic programmed cell death and excitotoxic cell death initiated by excess release of the neurotransmitter glutamate. Current objectives include 1) unraveling mitochondrial protease activities in bioenergetic dysfunction and reactive oxygen species production, 2) investigating calcium-dependent calpain proteases in neurotoxicity, and 3) understanding the roles of apoptosis-related proteins in mitochondrial maintenance and injury.

### Retreat, continued



Dr. Nuria  
Gonzales-  
Montalban

Dr. Lindberg is from the Department of Anatomy and Neurobiology, one of three academic department with which BioMET faculty are associated. Dr. Lindberg discussed some of her recent work on biological chaperones, proteins that help move other proteins into position in the cell. Her laboratory has discovered some unexpected functions for two of these proteins, 7B2 and ProSAAS, in preventing aggregation of secreted proteins so that they can be further processed to active forms. Her work ties in nicely with our faculty's interest in neurodegenerative diseases that are characterized by plaque formation of aggregated proteins.

After a short break, talks resumed with Associate Professor Shengyun Fang. He talked about his latest work on protein recycling and a possible mechanism for switching between the two major recycling pathways, Endoplasmic

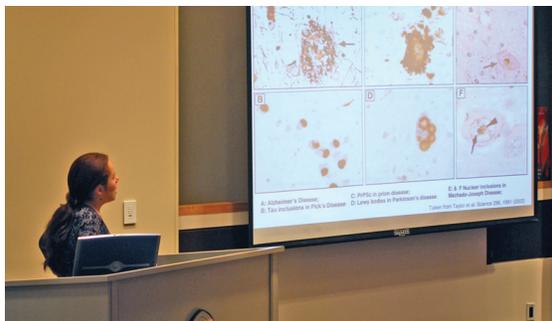
continued page 4



Dr. Iris Lindberg



Shengyun  
Fang



Valerie Albornoz

their on-going work on the regulatory role of ubiquitin, a protein originally discovered by Dr. Monteiro. The session ended with the second outside speaker, Dr. Shuwei Li. His work in proteomics is probably the most divergent from that found at BioMET. Proteomics looks at the entire protein profile of a cell, process or even organism. Like a DNA fingerprint, one can also have a protein fingerprint, though this is far more variable and represents the current state of the cell or organism and is not unique. However, changes in protein profiles can be very informative for the state of health or disease, something that will be extremely important in the development of individualized

medicine. Dr. Li is developing more cost effective ways of establishing a protein profile.



Dr. Mariusz Karbowski

After lunch, BioMET newest faculty member, Dr. Mariusz Karbowski, updated his work on mitochondrial dynamics. He was followed by Dr. Aristide Chikando from Dr. W. Jonathan Lederer's laboratory. He is involved in a new initiative in the laboratory looking at the contribution of mitochondrial calcium to cardiac calcium signalling pathways. This is extremely important to understand to make computer models of heart function more realistic.

Dr. Aristide Chikando

Reticulum Associated Degradation (ERAD) and autophagy. Valerie Albornoz from Dr. Mervyn Monteiro's laboratory discussed



Dr. Shuwei Li



Dr. Brian Polster

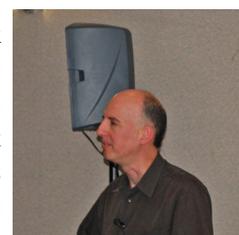
The session ended with the last outside speaker, Dr. Brian Polster, another mitochondrial researcher.

Dr. Polster combines two hot areas of research, mitochondria and oxidative stress. The current fad for anti-oxidants is based on the role of oxidative agents in disease and aging. Dr. Polster has devised a method to study cellular processes at physiological levels of oxygen (3%) rather than the more common atmospheric levels (20%). He has found that there are significant differences in how processes are regulated.

After a break, the last session was given by two BioMET faculty members, Dr. Bruce Vogel and Dr. Joseph Kao. Dr. Vogel updated his work on hemicentin's role in embryogenesis. Hemicentin is an extracellular matrix protein. These proteins have never been implicated

in embryogenesis before, so this work is opening a new area of research. Dr. Kao (pictured on page 2) returned to his roots, so to speak. It had been some time since he talked about his core work on caged molecules. These are biologically active molecules that have been made temporarily inactive by linking to a photosensitive reagent. When hit by a burst of light, the photosensitive reagent releases the molecule. It is now available to trigger biological events of interest. This allows researchers to control the timing and location of intracellular events precisely. Dr. Kao has developed an extensive set of these caged reagents.

As participants rushed off to get back in time for Dr. Greider's seminar, most were still talking about the science and next year's retreat.



Dr. Bruce Vogel

