

Biochemistry and Molecular Biology Department

BMB Newsletter



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University of Massachusetts Amherst

www.biochem.umass.edu

BMB Faculty

Maura Cannon	EMERITUS
Frank Cannon	Maurille (Skip)
Dan Chase	Fournier
Alice Cheung	Bruce Jacobson
Peter Chien	Tom Mason
Stephen Eyles	John (Jack) Nordin
Molly Fitzgerald-Hayes	Richard O'Brien
Scott Garman	Linda Slakey
Anne Gershenson	Ed Westhead
Lila Gierasch	LATE FACULTY
David Gross	Anthony
Daniel Hebert	Gawienowski
Alejandro Heuck	11/1/13
Li-Jun Ma	Trevor Robinson
Jennifer Normanly	5/12/11
Lou Roberts	R. Clinton Fuller
Danny Schnell	10/18/10
James Staros	Susan Cumberledge
Ludmila Tyler	7/28/08
Elizabeth Vierling	Jennifer Pinkham
Dong Wang	2/1/05
Hen-Ming Wu	Henry N. Little
Robert Zimmermann	4/29/89

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Erin Doherty	Carol Ryan
Angelica LeBoeuf	Cole Tucker
John Maher	Mary Ann Ziomek

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The College of Natural Sciences
UMassAmherst



I am pleased to present the accomplishments of our undergraduate majors, graduate students, postdocs, and faculty during the past year. We always enjoy catching up with our alums and would very much like to include you in our next newsletter or in web page profiles (send your news to: normanly@biochem.umass.edu).

Additionally, we would be very grateful for your participation in either a BMB Club event or our new Integrative Experience course, "Biochemistry in the Real World", which alumni are invited to visit to describe how they use biochemistry in their careers. Finally, please consider joining our LinkedIn Group: UMass Amherst Biochemistry and Molecular Biology Dept.

Jennifer Normanly
Department Head

BMB Students Shine



Gagandeep Singh

The **Henry Little Prize** is awarded to the BMB senior with the highest GPA who has excelled in research. The Prize went to **Gagandeep Singh** in 2013. Gagandeep was a Commonwealth Honors College scholar who worked in the lab of Assistant Professor Peter Chien on understanding how starvation and protein destruction were linked in bacteria. He is currently a medical student at Brown University.

The **Slakey Award** was established by former BMB Department Head and Commonwealth College Dean Linda Slakey to support summer research for a BMB major. The 2013 awardee is **Christopher Waters**, a member of the Wang lab, who has been researching the map-based cloning of a gene required for nitrogen fixation in the



continued next page **Christopher Waters**

plant *Medicago truncatula* and agrobacteria. Chris, now a senior, is continuing his research through graduation.

The **Jessica Hayes Scholarship**, made possible through the generosity of the Zak family in memory of their daughter, is granted to a sophomore or junior BMB major who has a GPA of 3.5 or higher and is actively engaged in departmental activities. Importantly, the nominee should demonstrate boldness in pursuing non-traditional challenges, a wide breadth of interests, and either creativity, innovation, or initiative in pursuit of a goal that has a positive impact on others.



Carolyn Kelly

The 2013 Hayes Scholarship recipients were **Carolyn Kelly** and **Samantha Williams**. Carolyn aspires to be a biochemical researcher studying the treatment of human diseases.



Samantha Williams

She conducts research in the Garman lab, is a BMB Peer Advisor, a member of the UMass Marching Band, and works at a summer camp for kids with hemophilia. Samantha (Sam) conducts research in the Gierasch lab on disease-causing mutations that effect protein folding, tutors athletes on campus and is active in the Pre-Med Society and the UCAN volunteer organization. She intends to work in the medical field.

The **Biochemistry and Molecular Biology Department Leading Strand Award** was established in 2012 and is given to the Biochemistry major who has shown leadership, initiative, and a demonstrated strength in working well with others.

The 2013 award winner was senior **Michael Veling** for his superb leadership as a co-founder of the Chalk Talks Registered Student Organization and his active participation in the BMB Club. Michael was also a Goldwater Scholar in 2012. He is currently a doctoral student in Biochemistry at the University of Wisconsin Madison where he has been awarded a three-year Molecular Biosciences Training Grant and will be researching mitochondrial proteins.



Michael Veling

Each of these student awards and scholarships is accompanied by a cash award, made possible by generous contributions to our departmental gift fund.

More Student Accomplishments

The **American Institute of Chemists** awards for excellence in biochemistry went to postdoctoral fellow Minsoo Kim in the Wang lab, and also graduate student Yadilette Rivera Colon and BMB senior Sarah Tarullo, both in the Garman lab. The **AIC Student Award Program** honors outstanding seniors, post-baccalaureate, and post-doctoral students majoring in chemistry, chemical engineering or biochemistry. The awards are given in recognition of demonstrated ability, leadership, and professional promise. Awardees are selected by BMB faculty.



M. Kim, Y. Rivera Colon, S. Tarullo

Three of the eleven graduating seniors chosen as **21st Century Leaders** university-wide in 2013 were double majors in BMB and another department. They were honored "for far-ranging achievement, initiative and social awareness." **Michael J. Boucher**, (double major in BMB and microbiology) is now in the doctoral program in microbiology and immunology at Stanford University. **Ankur Sheel** (BMB and neuroscience) plans to earn an M.D./Ph.D. and serve with Doctors Without Borders. **Michael Veling** (BMB and chemistry) is attending the graduate program in biochemistry at the University of Wisconsin Madison.

BMB senior **Ariel Toledo**, a member of the Vierling laboratory, was awarded second prize for his poster, "Design of Covalently Bound Dimers of Small Heat Shock Protein from *Pisum sativum*", at the Northeastern Louis Stokes Alliance for Minority Participation (LSAMP) meeting at Northeastern University in October. The LSAMP program provides funding to help support undergraduate research in science, technology, engineering or mathematics (STEM) laboratories.



Ariel Toledo



Bibin Paulose

Postdoctoral Fellow **Bibin Paulose**, a member of the Schnell lab, was awarded second prize at the 16th International Congress on Photosynthesis in St. Louis, Missouri in August for his poster entitled "Expression of algal bicarbonate transporters improves the efficiency of carbon fixation in plants."

BMB Majors Present Posters at Homecoming Event

A poster session held on the afternoon of October 18th, part of the **UMass Amherst Homecoming 2013** activities, showcased the phenomenal research being conducted on campus by the Biochem and Molecular Biology majors. More than 20 posters, on topics including protein stability, bacterial cell division, and neurotransmitter function, among others, were exhibited in the Life Science Laboratories 3rd floor lobby and provided an opportunity for the undergrad researchers to present and discuss their data with fellow undergrads, faculty and visiting alumni.



Undergrad Umaru Barrie (right) presents his research

Thanks to New England Biolabs!

The New England Biolabs Educational Course Support Division provided BMB with a number of products for use in our teaching labs. Not only do these products help us to stretch our recession-weary budget, but they also allow us to continue to train our students with top-quality, state-of-the-art reagents. Thank you, NEB!



BMB Reaches out to the Community

The **Eureka!** program, cosponsored by Girls Inc. of Holyoke and UMass Amherst's College of Natural Sciences, is providing thirty eighth-grade girls experience in science and technology projects with faculty members over five summers, as the students move through middle and high school. The goal is to encourage them, through mentoring, support and skill-building, to enroll in college and to choose careers in science, technology, engineering, and mathematics. BMB faculty **Elizabeth Vierling**, **Danny Schnell** and **Anne Gershenson** and BMB Adjunct **Jennifer Ross** volunteered to conduct labs with the students.



Prof. Elizabeth Vierling with an 8th-grade student from Holyoke

BMB Club up and Running

The **Biochem Club** is a non-profit, student-driven, scientific and educational service organization dedicated to serving students in BMB and other life science majors with respect to academics, research, and careers. In 2013, after starting off the fall semester with a General Meeting to greet new members and finalize their schedule, the Biochem Club hosted a Career Fair Prep Workshop, lead by Mary Ellen Liseno, Assistant Director of Career Planning who coached the students on how to get the most from a career fair. In October, the Club hosted presentations by UMass alumnus William Whitbold, Northeast Customer Service Manager at Wyatt Technology, and Verna Frasca, Technical Services Scientist at GE Life Sciences, and participated in the Homecoming Poster Session as well as a Graduate School Info Session with the UMass Medical School. November included a talk by Li Luo, Technical Specialist at Malvern Instruments and a trip to New England Biolabs in Ipswich, MA. Events already planned for the Spring semester include speakers from PAREXEL International, Contract Research Services and Ariad Pharmaceuticals.



Biochem Club officers and members visit New England Biolabs

The BMB Club is eager to make connections to alums who are within reasonable traveling distance from UMass Amherst and who would enjoy talking about how they have used their biochemistry degree.



BMB Faculty Briefs

Schnell Recognized for Research Excellence

Prof. **Danny Schnell** is one of five faculty on campus recognized at Faculty Convocation on October 4th. He was presented the **Award for Outstanding Accomplishments in Research and Creative Activity** for his work in organelle biogenesis and protein import into plant chloroplasts. He is currently the principal investigator on a 5 million dollar Department of Energy grant to develop a dedicated high-value biofuel crop.



Prof. Danny Schnell

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Gierasch Honored with Two Awards

Distinguished Professor **Lila M. Gierasch** has been selected to receive the 2014 **Mildred Cohn Award in Biological Chemistry**, given annually by the American Society for Biochemistry and Molecular Biology (ASBMB) to honor the pioneering scientific accomplishments and the spirit of Mildred Cohn, the first female president of the ASBMB. It recognizes and honors scientists at all stages of their careers who have made substantial advances in understanding biological chemistry using innovative physical approaches.



Prof. Lila Gierasch

In addition Prof. Gierasch has been named a 2014 **Fellow of the Biophysical Society** for her pioneering contributions to the understanding of the physical forces underlying protein folding. Awardees are members “who have demonstrated excellence in science and contributed to the expansion of the field of biophysics.”

New Life Science Laboratories Building Opens

A number of very excited BMB faculty and their lab members, along with faculty from five other departments on campus, moved their labs and offices into Phase I (the northern half) of the new Life Science Laboratories (LSL) on Thatcher Road, behind the Integrative Sciences Building. LSL contains state-of-the-art open-format laboratories designed to foster collaboration among clusters: cross-departmental research groups working on similar problems. The space also includes specialized equipment rooms, faculty offices, conference rooms and computing areas. BMB research groups now located in the LSL include the **Chien, Gershenson, Gierasch, Hebert, Ma, Normanly, Schnell, Vierling, Tyler and Wang labs**, along with the Mass Spectrometry Facility, directed by BMB faculty member **Steve Eyles**.



Life Science Laboratories

Phase II of the LSL, currently just a shell, will soon be outfitted for use by three new research centers thanks to a 95 million dollar award by Gov. Patrick. The Models to Medicine (M2M) center aims to translate basic protein research into drug treatments for diseases including Alzheimer's, Parkinson's and cancer. In addition to conducting research on these topics, BMB faculty **Scott Garman, Lila Gierasch** and **Elizabeth Vierling** are members of the center's organizing committee. One of the main goals for the new space is to increase collaboration with industry and thereby increase the translation of basic research to the biomedical marketplace.

Summer Institute Targets Teaching Effectiveness

Partnering with Five Colleges, Inc., Prof. **David Gross** hosted the second Summer Institute on Scientific Teaching (SI) in May, 2013. The SI aims to improve undergraduate STEM education by introducing faculty to evidence-based teaching strategies including active learning, aligned assessment, and inclusive instruction. The Five Colleges SI is modeled on the National Academies SI in which Prof. Gross also participates. Twenty-one participants from Amherst College, Hampshire College, Mount Holyoke College, Smith College, UMass, Amherst, and Westfield State University along with ten presenters and facilitators explored teaching pedagogies that have been shown to be effective in improving student learning outcomes.



Prof. David Gross

Loss to BMB

Professor Emeritus Anthony Gawienowski died on November 1, 2013. He joined the UMass faculty in 1963 as a member of the Chemistry Department and helped to create the then-named Biochemistry Department in 1966. Over a 3-decade career he conducted endocrinology research on steroid metabolism in mammals. His work included the study of the metabolism of diethylstilbestrol (DES) in the 1950s and this work helped to define some of the negative side effects of the drug.

Temper Tantrums: Stressed Bacteria Destroy Proteins

As published August 1 in *Cell*, grad student **Jing Liu** and Assistant Professor **Peter Chien**, along with the Laub lab at MIT, showed that bacteria respond to stress such as high temperatures by destroying DNA replication proteins. The destruction signal turns out to be the buildup of proteins that were misfolded because of the stress. High amounts of misfolded proteins trigger the protease to destroy an otherwise normal protein needed for DNA replication. Because destruction of this protein stops cell growth, cells don't waste resources before the stress ends. When the stress passes, the number of misfolded proteins drops, DNA replication begins and cells quickly restart growth. Stress and protein misfolding are a universal part of life, so understanding how simple bacteria deal with this kind of stress will help us understand how our cells do as well. This work was funded by the National Institutes of Health, the Howard Hughes Medical Institute and UMass Amherst.



Prof. Peter Chien

Chien Lab Reports Finding Bacterial “Needles in a Haystack”

Energy-dependent proteases are responsible for the removal of proteins from cells, a process required for normal growth, division and differentiation to take place, but which proteins are degraded, and when, remains unclear. Postdoctoral fellow **Nowsheen Bhat**, graduate student **Robert Vass**, and undergraduates **Patrick Stoddard** and **Dong (Brian) Shin** in the Chien lab, along with Assistant Professor **Peter Chien**, recently used a combination of biochemistry and mass spectrometry to ‘fish out’ proteins targeted for degradation during bacterial development. In recently published work, they report over 100 new candidate proteins that cover all aspects of bacterial growth, including DNA replication, transcription, and cytoskeletal changes. Eliminating the ability to degrade one of these new targets makes the bacteria unable to differentiate properly, thereby dramatically affecting bacterial development. Because these developmental changes are essential for bacteria to invade a host, these insights could identify new drug targets in antibiotic-resistant bacteria, a growing human health concern.

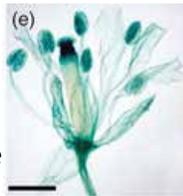


ClpP Dong (Brian) Shin in the Chien lab, along with Assistant Professor **Peter Chien**, recently used a combination of biochemistry and mass spectrometry to ‘fish out’ proteins targeted for degradation during bacterial development. In

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Cannon Lab Describes Mutant Self-rescue

Research Associate Professor **Maura Cannon**, postdoctoral fellows **Prasenjit Saha** and **Indrajit Dutta** and undergraduate **Nicole Evangelous**, along with collaborators at the Noble Foundation, Ardmore, OK, and at Ohio University at Athens, reported in *The Plant Journal* in July on a cell wall mutant in *Arabidopsis* that rescues itself and undergoes a reversion to a normal phenotype by switching to an alternate gene expression landscape. This allows apparently normal growth and produces a fertile plant. This work “has implications for interpreting the cause of any mutant phenotype, assigning gene function, and genetically modifying plants for utilitarian purposes.”



Chase and Maher Publish New Knockdown Strategy



Double-stranded RNA interference (dsRNAi) targets gene-specific mRNAs for destruction and is a powerful approach for rapidly assessing gene function. Assistant Professor **Dan Chase** and postdoctoral fellow **Kathryn Ma-**

her reported in the June issue of *Genetics* that they developed a novel method for cell type-specific knockdown of gene expression in *C. elegans* which overcomes limitations of previous methods. This new approach is stably inherited, absolutely cell-autonomous and can also be controlled

temporally, allowing the timing of gene knockdown to be controlled by the investigator. Using this new knockdown approach, protein function can now be investigated with single-cell resolution in live animals.

Cheung to Present Distinguished Faculty Lecture

Prof. **Alice Cheung** has been chosen as a 2013-2014 **Distinguished Faculty Lecturer**. In March she will deliver the lecture “The Birds and the Bees: How Do Plants Produce Seeds?”, the story of the “mating games” in flowers that lead to the production of seeds.



Prof. Alice Cheung

Grants

Grants were renewed or awarded for the following faculty members’ research:

Professor **Alice Cheung**: The functional roles of FERONIA, LORELEI and relative proteins in regulating pollen-pistil interaction (NSF)

Extension Associate Professor **Stephen Eyles**: Acquisition of an Orbitrap MS (NIH)

Distinguished Professor **Lila Gierasch**: Modeling a cellular protein homeostasis network (NIH, 4 years)

Professor **Danny Schnell**: Development of a dedicated, high-value biofuels crop (DOE ARPA-E, Phase 2: 1.5 years)

BMB Alumni News

Alumni Updates

Nazia Ahmed '02BS started in September as an Industrial Chemist with Buckman Laboratories in Memphis, TN. She tests samples from customers from the leather, water, and paper industries that are served by Buckman Laboratories. These analyses include solvent extractions for leather fat content, HPLC and GC for active compound analysis in leather, ion chromatography for amines analysis and ion coupled plasma for metals analysis in water samples.

KaiMing (Kyle) Chiang '10BS is working at Merrimack Valley Hospital, Haverhill, MA, as a Physician Assistant in the emergency room. He assesses and treat patients of all ages with medical problems ranging from basic lacerations to cardiac arrest.

Amanda Clouser '11BS is currently a PhD candidate at the University of Washington in Seattle studying the structure and function of oligomeric human small heat shock proteins using primarily NMR. Her research focuses on atomic level changes due to disease mutations and stress conditions in order to understand their global effects on quaternary structure.

Alumni Updates, cont'd.

Denis Drygin '02MCB PhD is Vice President of Research and Development at Pimera, Inc. in San Diego, California, a new biotechnology company that is focused on targeting fundamental cellular pathways to transform the treatment of cancer.

Andrew Dunford '13BS is an Associate Computational Biologist at the Broad Institute of Harvard and MIT. He processes the large amounts of sequence data from cancer samples in order to determine which genes are significantly mutated and likely play a role in cancer.

Mylene Ferrolino '13MCB PhD is a Postdoctoral Research Associate at St. Jude Children's Research Hospital in Memphis, TN. She is working to understand the role of intrinsically disordered proteins (IDPs) in modulating protein-protein interactions.

Richard Gilmore '10BS '11MCB MS is now an Associate Scientist II in the Cell Culture Development department at Biogen Idec in Cambridge, MA, working in the Pilot Scale group, which focuses on refining cell culture scale-up strategies that will eventually be used on large scale manufacturing bioreactors. The material that is collected from these bioreactors is eventually purified for biologics, primarily used to treat multiple sclerosis and hemophilia.

Daniel Kita '13MCB PhD is now a Postdoctoral Fellow in the Department of Vascular Biology at the UCONN Health Center in the lab of Dr. Kevin P. Claffey. Dan is working on implementing their discovery platform for tumor antigens by using a library of patient-derived antibodies to screen normal and tumor breast tissue, breast cancer cell lines, and conditionally reprogrammed cell lines from human primary normal and tumor tissue. The goal is to rapidly identify breast tumor antigens to guide the development of anti-cancer vaccines, immunotherapies, and breast cancer biomarkers.

Kathryn Levasseur BMB '04, successfully defended her Ph.D. thesis, "Elucidating the virulence control network of *Francisella tularensis*", at Harvard Medical School.

Katie Maher '13MCB PhD, currently a Postdoctoral Fellow in the Chase lab studying dopamine signaling in *C. elegans*, was recently a guest on The Bill Newman Radio Show on WHMP (December 16, 2013) discussing the Supreme Court case against Myriad Genetics and the landmark ruling that defeated human gene patents. Katie is also a member of the Governing Board of the Massachusetts Academy of

Sciences, a founding member of the Graduate Women in STEM organization, and a Massachusetts Academy of Sciences STEM volunteer.

Stephanie Mullane '13BS is a Data Research Specialist working on translational research on Bladder Cancer at Dana Farber Cancer Institute. She collects clinical data and combines it with information on genomic alterations to help determine what determines bladder cancer aggressiveness and progression.

Peter Nash '13BS is a Research Scientist at Microbiotix, Inc., a biotech company located in Worcester, MA. He is part of the virology group and focuses on finding small-molecule inhibitors of Ebola and/or influenza viral infection.

Igor Romashko '08BS (BMB, CompSci) and **Charles Beyrouthy '12BS** (BMB, ChemEng) are co-founders of LabCloud, Inc., a startup based at the Venture Development Center at UMass Boston specializing in implementation of affordable laboratory software that assists labs in managing the facets of the R&D pipeline. Last year, both Igor and Charles were Sponsored Entrepreneurs (sponsored by Oracle) at the Mass Innovation unConference.

Alumni Publications

Adedamola (Damola) Adepoju '06BS, '07MS and co-authors published a paper titled "Fgf2 and insulin signaling converge to regulate cyclin D expression in multipotent neural stem cells" in the October 23, 2013, issue of Stem Cells. Damola recently earned his MD at UMass Medical School in Worcester and is currently a Neurosurgery Resident at the Albany Medical Center.



Fabian Romano Chernak '12PhD, a postdoctoral fellow at Harvard Medical School, is a co-author on the paper "Multiple mechanisms determine ER network morphology during the cell cycle in *Xenopus* egg extracts" published in the December 9 issue of Cell Biology. Fabian earned his PhD degree in the Heuck lab.

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