



## From the Department Chair...

The year 2011 was our 50th anniversary and we had a wonderful day of celebration on April 21.

Thank you to the large number of friends who came to East Lansing to celebrate. It was wonderful to meet so many people from all phases of the department, from one of the founding professors, Willis Wood, to the many undergraduates and graduate students who participated.

During the last year, the department has continued to grow in many ways. We welcomed two new assistant professors: Monique Floer and Erik Martinez-Hackert (see page 5). The number of undergraduate students increased again as evidenced by the 121 new students who arrived in the fall and selected biochemistry as their major. Many of our undergraduates go on to graduate school, so we continue to emphasize undergraduate research experiences in our labs - an almost essential experience for students intending to go to graduate school.

In a recent exit poll, 70 percent of our undergraduate students indicated they had some kind of research experience. Through his generous support of the Professor Richard L. Anderson Endowed Undergraduate Research Prize and Dr. James K. Billman Undergraduate Research Awards, Dr. James Billman has enhanced the opportunities for undergraduate research in the department. These funds have had a tremendous impact as they provide biochemistry students with scholarships to support their research. It was a pleasure to welcome Dr. Billman to the 50th anniversary celebration where he was able to make some of these awards in person.

While research funding at the national level remains flat, BMB professors have increased their funding and we saw a significant upturn in total research dollars in 2011. While basic research in service to humanity is the goal, we can only achieve this with excellent funding, and the team of professors in the department were very successful in 2011.

We anticipate more changes in the department in 2012. Very sad news is that Professor Rawle Hollingsworth passed away in February (see page 6). Professor Pam Fraker will retire in May, however, she will continue in a mentoring role in the department. We have several searches underway and we anticipate at least as many new faculty in 2012 as we had in 2011.

At the annual Awards Banquet on April 12, 2012, we will be announcing the department's first graduate fellowship endowment. Dan Kassel, a former student of Jack Throck Watson, has overseen donations to endow the Jack Throck Watson Endowed Graduate Fellowship (see page 6).

Attracting outstanding graduate students is a high priority. In 2011, a new graduate student recruitment organization was put in place. The Biomolecular Science Gateway recruitment program (see page 3) is directed by Professor John LaPres and has replaced the BMB recruitment activities. So far the program is living up to expectations of bringing more outstanding graduate students to BMB and related

departments and programs as we had more than 100 potential graduate students on campus last month to interview for positions in our graduate program.

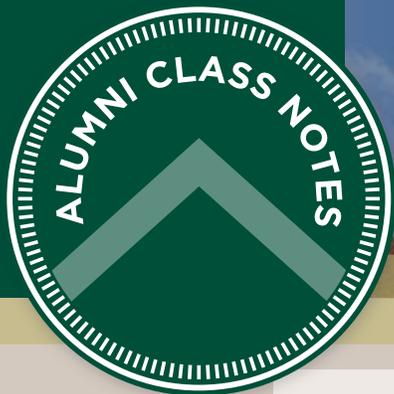
Also this year we are anticipating that at least two labs (Christoph Benning and Dean DellaPenna) will move across the street to the recently completed Molecular Plant Science Building. This building shows the continued commitment of MSU to the plant sciences and will house the research labs for faculty from Biochemistry, Plant Biology, Plant Research Laboratory and Horticulture. An open lab design will make the space flexible and maximize interactions among scientists. What we lose in interactions within the Biochemistry Building will be more than compensated by the interactions with plant scientists from other departments.

Inside this newsletter you will find a sampling of stories about life in the department over the last year. Thank you for taking the time to stay connected. Your continued support of our programs and students plays a tremendous role in the success of our alumni. 🍷



*Thomas D. Sharkey, Ph.D.  
Chair,  
Department of  
Biochemistry and  
Molecular Biology*





Joe Mayo, Ph.D. '68, is presently practicing pediatrics in Carthage, Missouri.

Harry Brumer, '93, is transitioning to begin a professorship in the Michael Smith Laboratories at the University of British Columbia, Vancouver, and will hold a joint appointment in the Department of Chemistry at UBC.

Andrew Zimolzak, '02, recently finished a co-chief residency at Saint Louis University and has moved to Boston where he is doing a postdoctoral research fellowship in biomedical informatics. This training program is supported by the National Library of Medicine and he is earning a Master of Medical Science degree from Harvard Medical School.

Travis Reed, '05, has accepted a position that will begin in July 2012 as a Resident in Small Animal Surgery at the Chesapeake Veterinary Surgical Specialists in Annapolis, Maryland, and has also had an article published in the Journal of the American Veterinary Medical Association.

Stephen Dostie, '10, recently joined the Michigan Biotechnology Institute as a de-risking professional where he does work in the pilot plant and prep lab to start the fermentation process.

Nick Hoover, '10, recently accepted a new position at Eli Lilly and Company in the Indianapolis area. ♡

*Help us share your career news, awards, promotions and accomplishments with students and alumni — <http://ns.msu.edu/StayConnected>*

## García-Pérez Receives NIH Director's Award

Arlyn García-Pérez, Ph.D. '84, was the recipient of the Director's Award from the National Institutes of Health. She is the Assistant Director of the NIH Office of Intramural Research and



*Arlyn Garcia-Perez*

received the award for diligence and precision in overseeing, interpreting, and safeguarding the tenure-track and tenure process at NIH.

García-Pérez's dedication to a diverse scientific workforce and mentoring of scientists has been recognized with many prestigious national awards. She is the first woman to have received the Boezi Distinguished Alumnus Award from the Department of Biochemistry.

During her years at MSU, she studied under William Smith and her doctoral research involved the study of prostaglandin metabolism and function in the kidney, largely unknown at that time. She has authored more than 50 peer-reviewed publications and is an active member of several national and international professional societies such as the American Society for Cell Biology.

In 1999, García-Pérez became Assistant Director in the Office of Intramural Research, Office of the Director at NIH where she is a member of the senior leadership team. The OIR is responsible for oversight and coordination of all intramural research, training and technology transfer conducted at the NIH through policy development and implementation. ♡

## Postdoctoral Alumni

Yan Lu, a postdoctoral research in Rob Last's lab, is now an assistant professor in the Department of Biological Sciences at Western Michigan University. Her research on plant physiology examines the regulation of photosynthesis and the accumulation of essential amino acids in plants and the biosynthesis of aspartate-derived amino acids. ♡

Laurent Mène-Saffrané, a postdoctoral researcher in Dean Della Penna's lab from 2006-2011, is a lecturer in the Department of Biology (Plant Biology) at the University of Fribourg in Switzerland. Mène-Saffrané has a Ph.D. from the University of Toulouse and also served as a postdoc at the University of Lausanne. ♡



## Gutiérrez Receives HHMI Early Career Award

Rodrigo Gutiérrez, Ph.D. '03, has received a Howard Hughes Medical Institute (HHMI) International Early Career Award. He is a faculty member at Pontifical Catholic University of Chile where



Rodrigo Gutiérrez

he uses a systems biology approach to examine how plants detect and respond to nitrogen. He hopes to improve the efficiency with which plants use nitrogen and therefore reduce demand for fertilizers and the impact on the environment.

Gutiérrez is identifying gene networks and examining how nitrogen-sensing pathways interact with pathways through which plant hormones trigger growth and development. He looks at how a plant responds and how that response varies in different cells and as the plant progresses through different life stages.

Gutiérrez earned a B.S. and M.S. from Pontifical Catholic University of Chile before arriving at Michigan State. He is one of 28 recipients of the HHMI career awards. The career awards program is the latest incarnation of HHMI's international grants to individual researchers. 🌱

## Moellering Presents Kende Lecture

Eric Moellering, Ph.D. '10, returned to MSU to present the Hans Kende Memorial Lecture in December at the Plant Research Laboratory. Moellering is a scientist at Synthetic Genomics in LaJolla, California, and his presentation was titled "Non-polar lipid bodies in plants and algae: Roles in stress adaptation, metabolism, and storage." Moellering was a member of Christoph Benning's Lab while earning his doctoral degree. 🌱

## Department Celebrates 50 Years

The department celebrated its 50th anniversary in April with several lectures, awards and a detailed publication on the history of biochemistry at MSU.

Doug Randall, Ph.D. '70, was the featured speaker for the N. Edward Tolbert Lecture. Randall, who earned his doctoral degree under Tolbert, is a member of the National Science Board and a professor emeritus of the University of Missouri. Randall's presentation, titled "Wandering Among the Phosphates" and can be viewed on the BMB website at <http://www.bmb.msu.edu/dept/50index.html>.

The anniversary celebration also included the investitures of David Kramer and

Robert Last along with presentations from faculty leaders and former department chair William Smith.

Two other alumni returned to campus to present seminars as part of the celebration. Diane Husic, Ph.D. '86, presented a student seminar "From Superfund to Superhabitat: A Story of Hope for Our Ecological Future." Husic is chair of the Department of Biological Sciences at Moravian College. Li Fan, Ph.D. '00, an assistant professor at the University of California – Riverside, presented the R. Gaurth Hansen Lecture.

Professor Emeritus Clarence Suelter compiled a "50 Year History" on the department. The 750-page PDF book is available free on the website. 🌱

## New Program Recruits BMB Graduate Students

Michigan State has launched a new initiative for recruiting graduate students in biomolecular sciences, including all advanced degree students in the Department of Biochemistry and Molecular Biology.

"We developed the Biomolecular Science Gateway to serve the six biomolecular graduate programs at MSU, and having these programs under one umbrella allows us to more effectively recruit students and have them placed in the programs and laboratories to best fit their skills and career goals," says John LaPres, director of the program.

The Biomolecular Science Gateway provides recruiting, admission, and first year support and advising to MSU graduate programs in Biochemistry and Molecular Biology, Cell and Molecular Biology, Genetics, Microbiology and Molecular Genetics, Pharmacology and Toxicology, and Physiology.

By unifying the graduate programs, students have access to training in more than 150 research laboratories. During their first year in the Gateway,

all students rotate through the laboratories of potential Ph.D. mentors and take coursework appropriate to their disciplinary interests. Near the end of their first year, each student then selects the Ph.D. program that aligns most closely with their educational goals.

"By funneling all graduate students through this process, we ensure students are in the lab and program that they are comfortable with and meet their career goals. Allowing the students to make an informed decision about the program they will join will also reduce students switching programs which can prolong graduation," adds LaPres.

Given the interdisciplinary nature and amount of cross-over in these six programs, having these programs under the umbrella of biomolecular science makes it more efficient for recruitment, promotion and admissions.

"It is more effective to have one unified program instead of six departments working independently to recruit, admit, and start training these students," adds LaPres. The first cohort of students will arrive this fall. 🌱



## IDEAS Program Aims to Bolster Retention

A new program designed to mentor students and improve graduation rates is immersing freshmen and sophomores in laboratory research.

The Increasing Diversity and Education Access to Sciences, or IDEAS, program is in its second year in the Department of Biochemistry. The program is modeled after established by Richard Losick at Harvard University with support from the Howard Hughes Medical Institute.

The IDEAS program provides a unique entry point for first-year students who have had limited opportunities to pursue their interest in science. The program is open to first generation college students and underserved students who may be at a disadvantage due to their education prior to arriving at MSU.

“By bringing freshmen into a lab and getting them involved immediately, we are able to provide guidance and

help them grow their skills during a time when they otherwise may begin struggling at a large research university,” says Zach Burton, one of three faculty members leading the program. “Our hope is to improve retention of students who have a passion for biochemistry but may not have previously had access to the best tools or the guidance needed for their personal growth.”

IDEAS students are placed with professors in host laboratories where they receive mentoring and annual stipend support for long-term, hands-on research projects. A key feature of the IDEAS program is creating a community of students and faculty that provides critical mentoring and support for freshmen as they step into research projects at the start of their undergraduate education.

The program is also associated with the Gene Expression in Development



Lestella Bell (center) works in the lab with David Achila (left) and Professor Honggao Yan (right). Photo by Melinda Kochenderfer.

and Disease group along with the MSU Honors College and the College of Natural Science’s Charles Drew Science Scholars program. MSU hosted Richard Losick last year during a visit to campus to discuss the IDEAS program as it is expanding to universities across the country. 

## Biochemistry Faculty Named to Prestigious Positions

An investiture ceremony in April officially recognized two new named faculty positions, the first such positions in the Department of Biochemistry and Molecular Biology at MSU. David M. Kramer was named the Hannah Professor of Photosynthesis and Bioenergetics. Robert L. Last was named the Barnett Rosenberg Chair of Biochemistry.

“Having two named faculty positions is an important step in assuring the future quality and international pre-eminence of our department,” said R. James Kirkpatrick, dean of the College of Natural Science. “Named positions allow us to proactively recognize our current faculty while helping attract students and faculty through the prestige associated with positions.”

As the Hannah Professor of Photosynthesis and Bioenergetics, Kramer studies how plants convert light energy into substances usable by life through photosynthesis. The position was funded by the university as an initiative to advance plant sciences. Kramer’s research lab is part of the Plant Research Laboratory.

Kramer works with both plants and algae to understand how improving the efficiency of photosynthesis could be applied to bioenergy, and his work includes energy processes at the molecular and the physiological levels of plants.

Last, whose research focuses on functional genomics and how plants produce diverse chemicals and metabolites, was named the Barnett

Rosenberg Chair of Biochemistry, a position funded by the MSU Foundation.

Last has also helped build a system for providing research experiences to undergraduates across the country. Along with Professor Richard Allison and Lab Manager Linda Savage, he runs a plant genomics summer program as part of an NSF Research Experience for Undergraduates (REU). It brings students from across the country to MSU where they gain experience in biochemistry, genetics, metabolomics, and the scientific method. 



## Two Faculty Named AAAS Fellows

Two biochemistry professors were among the nine MSU professors earning national recognition by being named Fellows by the American Association for the Advancement of Science in December.

Gregg Howe aims to understand how plants respond to insect herbivory and other forms of wound stress. Howe uses tomato and Arabidopsis as experimental model systems to explain the mechanism of synthesis and action of the plant hormone jasmonate, and to study the molecular evolution of chemical traits that shape plant-insect interactions.

Thomas D. Sharkey focuses on the biochemistry and biophysics of gas exchange reactions between plants and the atmosphere. A major area of his research involves photosynthetic carbon fixation from carbon dioxide uptake through to synthesis of sucrose and starch. He also examines isoprene emissions from plants to the atmosphere and his research has shown that isoprene made by plants can help leaves tolerate the high temperatures caused by sunlight.

Election as a Fellow of AAAS is an honor bestowed upon members by their peers. Fellows are recognized for meritorious efforts to advance science or its applications. Sharkey and Howe join other department faculty, including Dean Della Penna, Ken Keegstra, and Robert Last.

## Kroos Provides Commencement Address at BGSU

Professor Lee Kroos provided the commencement address for the graduate degree program at Bowling Green State University last May. Kroos received his B.S. from BGSU in 1981 and has also been recognized as a Distinguished Alumnus by the BGSU Department of Chemistry.

## Floer and Martinez-Hackert Join Faculty

Monique Floer and Erik Martinez-Hackert joined the department in 2011 as assistant professors.

Floer is working to understand how the process of gene expression is regulated and the effects of chromatin. She is investigating how mammalian cells deal with the "nucleosome problem" using the tools developed in yeast. She studies how certain immune cells are recruited into the microenvironment of many cancers and switch their behavior to promote tumor growth. Floer and her students are understanding how gene expression is regulated in these cells so they can modulate their function in the future.

Before coming to MSU, Floer spent 12 years as a postdoctoral researcher and research associate at Sloan Kettering Institute. She has a Ph.D. from The Rockefeller University and a B.S. from the Universität zu Köln, Germany.

Martinez-Hackert is a structural biologist specializing in X-ray crystallography and has extensive experience in using genetic, molecular biological, biochemical and biophysical approaches to relate structure and function.

His experience increases the faculty knowledge of the biotechnology industry, especially with regards to



Monique Floer



Erik Martinez-Hackert

the development and production of biologics - proteins that are used as therapeutics. His research involves the TGF- $\beta$ -family protein Nodal, its regulators and receptors. Nodal is a prominent embryogenic factor that is also highly expressed in metastatic cancers, including Melanoma, and breast and prostate cancers. He is mapping and characterizing interactions that modulate Nodal signaling.

Martinez-Hackert was a Senior Scientist at Acceleron Pharma in Cambridge, Massachusetts, studying TGF- $\beta$  receptors, their ligands, and antibodies. He did postdoctoral research in Wayne Hendrickson's lab at Columbia University where he investigated structure-function relationships of chaperones and immune receptors. He received his Ph.D. from Rutgers University, with mentor Ann Stock, studying bacterial two-component proteins.

## Ferguson-Miller Receives Biophysical Society Award

University Distinguished Professor Shelagh Ferguson-Miller was awarded the 2011 Anatrice Membrane Protein Award by the Biophysical Society at their annual meeting in March. She was recognized for her contributions to the knowledge of molecular bioenergetics and membrane protein biochemistry, and presented an awards lecture titled "Role of conserved water, conserved lipid and conformational change in energy conversion by cytochrome c oxidase."

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## Fraker Scholarships Support Undergraduates

A new undergraduate scholarship has been established to benefit and encourage students in biochemistry. The Pamela J. Fraker Undergraduate Scholarship was established with a gift made by University Distinguished Professor Pam Fraker.



Pam Fraker

While an undergraduate student at Purdue University, Fraker received a full scholarship and she credits the financial assistance provided by that scholarship for enabling her success.

Fraker's career has focused on studying the relationships between nutritional status and the integrity of the immune defense system. Her pioneering research has shown that a modest degree of malnutrition has rapid and adverse impact on immune systems. Malnourished children, in particular, have more infections and higher mortality rates than well fed children.

Establishing the scholarship fund provides students with opportunities to focus their undergraduate education, much like Fraker was able to do with her undergraduate scholarship.

"The opportunities for biochemistry students at MSU to become immersed in education and research are vast, and providing scholarship funds enables them to focus their talents and provides them with a solid start to their careers," Fraker says. "I am pleased to be able to help out students the same way I was assisted in my early career years."

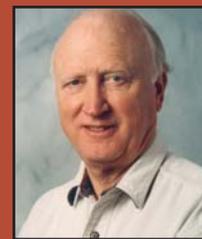
Fraker's research has helped attract other faculty to the MSU and provided a strong program for students to gain experience in research alongside scientists in the area of molecular metabolism. Fraker received her Ph.D. from the University of Illinois and is the first female faculty member at Michigan State to become a member of the National Academy of Sciences.

The Fraker Scholarship is awarded annually by the department. Recipients must have achieved sophomore status, have a minimum 3.0 grade point average and demonstrate financial need.

The first scholarships were awarded last year to biochemistry majors Stephanie Vanderstelt, Yen-Nhu Nguyen and Rashelle Thompson. The department will be awarding the next group of scholarships in April. 🍀

## Watson Endowment is First to Support Fellowships

Former students and colleagues of retired professor Jack Watson have established the department's first endowment for graduate student fellowships. The Jack



Jack Watson

Throck Watson Graduate Fellowship in Biochemistry Endowment was recently established to provide funding for graduate students in the department. Recipients of the fellowships will be selected by the department each semester.

"As government funding of research continues to shrink, and as competition among universities for the best students intensifies, we must ensure graduate student support in order to maintain the excellence of our program," says R. James Kirkpatrick, Dean of the College of Natural Science. "The alumni and colleagues who helped create this endowment have made a lasting impact on the lives of the students as well as the long-term success of the program."

The endowment honors Watson, a longtime professor of both biochemistry and chemistry, who retired in 2006. His research involved the characterization of peptides and proteins by mass spectrometry with fast atom bombardment, electrospray ionization and matrix assisted laser desorption ionization.

Watson received a B.S. from Iowa State University and a Ph.D. from the M.I.T. School of Aerospace Medicine. He held positions at the University of Strasbourg and Vanderbilt University before arriving at MSU in 1979.

The fourth edition of Watson's book *Introduction to Mass Spectrometry* was published in 2007. He is enjoying retirement and lives in Laingsburg, Michigan. 🍀

## Rawle Hollingsworth: 1956 - 2012

Professor Rawle Hollingsworth died unexpectedly in February at the age of 55.



Rawle Hollingsworth

Hollingsworth came to MSU as a research associate in 1983. In addition to teaching, he held an active research lab focused on the development of synthetic strategies for compounds in medicinal chemistry.

He also operated his own company, AFID Therapeutics Inc., which was the first tenant in MSU's new Bioeconomy Institute, located in a former Pfizer laboratory in Holland, Mich. Hollingsworth's research on complex carbohydrates derived from biomass and sugars forms the basis for developing high-value chemical compounds. The compounds can be used to create drugs for infectious diseases and autoimmune, cardiovascular and neurological disorders, as well as specialty chemicals for other purposes. 🍀



# Capturing Genetic Blueprints for 14 Medicinal Plants

The Medicinal Plant Consortium, a NIH-supported project involving seven institutions, has cataloged the transcriptomes (all the genes that are expressed) and all the major chemical metabolites in 14 medicinal plant species.

The project utilized a broad spectrum of expertise from plant biology and systematics to analytical chemistry, genetics, bioinformatics and molecular biology. Biochemistry professors Dean DellaPenna and Dan Jones, Plant Biology professor C. Robin Buell and Horticulture Assistant Professor Cornelius Barry were involved in the two-year project that collected data to match up the specialized genes in each plant to the chemical compounds they produce.

“Capturing the genetic blueprints of these 14 medicinal plants is a significant step in the advancement of plant-based drug discovery and development,” said DellaPenna, lead investigator at MSU and one of three principal investigators on the project. “Having these data for these 14 plants brings them into the 21st century in terms of the tools researchers can now use to study them.”

“For instance the well-known garden plant, *Digitalis purpurea*, commonly known as foxglove, is the source of a common heart arrhythmia medicine (digoxin) used daily by millions of individuals, but only 60 gene sequences were publicly available for the plant,” said DellaPenna. “One result of our work is that 30,000 gene sequences are now openly available for it.”

The researchers are continuing to study the genes and chemical profiles to understand how genes uniquely expressed in one species might lead to the major medicinal compounds produced by that plant. Currently 6 of the metabolomes for all 14 of the plant species are published on the project website ([medicinalplantgenomics.msu.edu](http://medicinalplantgenomics.msu.edu)).



Professor Dean DellaPenna (center) along with Lab Manager Maria Magallanes-Lundback (left) and Postdoctoral Researcher Radin Sadre (right) continue to study the genes and chemical metabolomes of the 14 medicinal plants.

The MPC website hosts the complete transcriptomes and corresponding gene expression data for the 14 medicinal plants. Expression levels for the representative transcripts were determined by high through-put Next Generation DNA sequencing and are provided from a diverse array of tissues. The site also provides searching capability for the final transcriptome assemblies for the plant species.

The MPC website is maintained and hosted by the Buell Lab at Michigan State University. Having the raw and processed datasets available through the project website was a main objective of the project. This site provides scientists across the globe the ability to download and compare the sequences, annotations, transcript expression and metabolite data sets.

“The data on the website provides all researchers with the full set of transcribed genes and metabolomes of these 14 medicinal plants, and affords them the opportunity to identify genes and pathways involved in drug synthesis,” says DellaPenna. “This information may allow us to use recombinant plant enzymes for synthesis,

or to modify plant metabolism so that they naturally produce safer, better tolerated drugs.”

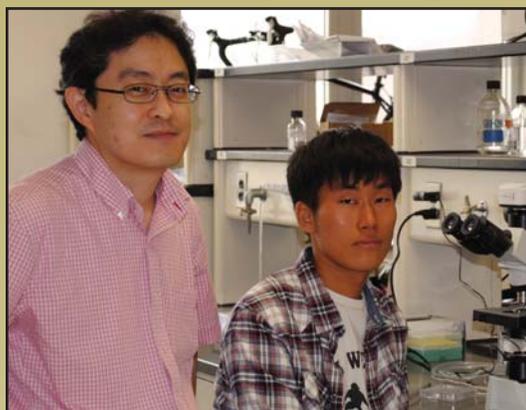
The 14 plant species are:

- *Atropa belladonna*,
- *Camptotheca acuminata*,
- *Cannabis sativa*,
- *Catharanthus roseus*,
- *Digitalis purpurea*,
- *Dioscorea villosa*,
- *Echinacea purpurea*,
- *Ginkgo biloba*,
- *Hoodia gordonii*,
- *Hypericum perforatum*,
- *Panax quinquefolius*,
- *Rauvolfia serpentine*,
- *Rosmarinus officinalis*, and
- *Valeriana officinalis*.

The consortium principal investigator is Joe Chappell at University of Kentucky and Della Penna along with Sarah O'Connor from MIT are co-principal investigators. Also participating are scientists from Iowa State University, the University of Mississippi, Purdue University, Texas A&M University, Massachusetts Institute of Technology, and the John Innes Centre in Norwich, England. 🌱

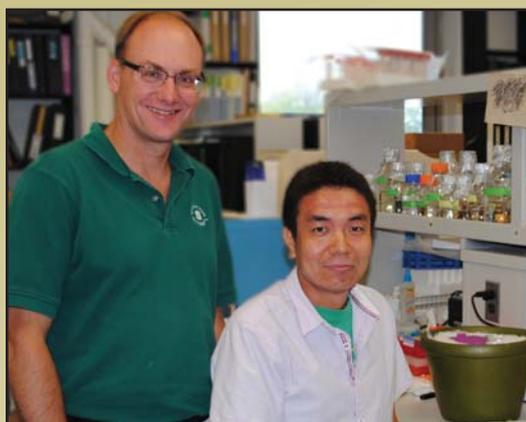
College of Natural Science  
103 Natural Science Building  
East Lansing, MI 48824-1115

## BMB Labs Host Japanese Researchers



Following last year's disaster in Japan, several biochemistry faculty members opened up their labs to host researchers from Japan who otherwise would not have been able to continue their work due to disruption of power and other issues effecting research facilities. Gregg Howe, Rob Last and Hideki Takahashi hosted students and postdocs from the University of Tokyo and the National Institute of Advanced Industrial Science and Technology for several months as they continued their research.

*Top: Assistant Professor Hideki Takahashi (left) provided a temporary research home for Takayuki Tamaki, a graduate student from the University of Tokyo.*



*Bottom: Professor Gregg Howe (left) hosted post-doctoral researcher Masaru Nakata from the National Institute of Advanced Industrial Science and Technology.*

## Upcoming BMB Events

←—————→  
All alumni and friends are invited!

### Department Open House

April 12, 2012  
8:30am - 11:15am  
208 Biochemistry Building

### John A. Boezi Memorial Alumnus Lecture

Presented by Beth A. Garvy  
from the University of Kentucky  
College of Medicine  
April 12, 2012  
11:30am - 12:30pm  
101 Biochemistry Building

### Annual Department of Biochemistry & Molecular Biology Banquet

April 12, 2012  
5:00pm - 9:00pm  
Spartan Club in Spartan Stadium