

# DEPARTMENT OF Physiology

**MSU** College of Natural Science | Newsletter for Alumni and Friends

## From the Department Chair...

Welcome to the 2015 edition of the MSU Department of Physiology newsletter.

This past year has been a busy one in the department, with a wide array of changes as we continue to build upon our long-standing reputation of research strengths in physiology.

In addition, multiple university-wide initiatives, including the current Empower Extraordinary capital campaign, should have significant impact on positive growth in the department. As we continue to move forward, we will target faculty hires to enhance existing strengths and strive for research programs with integrated approaches that foster the collaborative nature of research at MSU and that strike a balance between academic research and teaching.

Thanks to the concerted efforts of our faculty, we welcomed two new, highly talented, research faculty members to our department this year. Hariharan Subramanian joins us from the Pathology Department at the University of Pennsylvania School of Dental Medicine. His research focuses on discovering and developing novel strategies to target mast cells and prevent allergic asthma. Rupali Das joins us from the Division of Oncology at the Children's Hospital of Philadelphia. Her research focuses on developing novel approaches to target immune cells in certain human diseases such as cancer. We were also fortunate to hire Migdalisel Colon-Berlinger from the Biology Department of the University of Puerto Rico. She will be one of our key faculty instructors at the MSU College of Human Medicine's Grand Rapid's campus. Read more about these impressive new additions on page 3.

Our front office staff has changed as well, with the addition of Diane Ring and the retirement of Linda Jacques, who had 28 years at MSU.

As the appearance of our department continues to change, we wish the best to our latest retiree: David Kreulen. Dave joined the MSU faculty in 1998, and served as interim chair from 2011-2013. In addition to being an internationally respected researcher, Dave had a significant impact on our department and educational mission prior to my arrival in 2013. Dave and his wife, Grace, have resettled back to the west side of Michigan.

***“This past year has been a busy one in the department ... as we continue to build upon our long-standing reputation of research strengths.”***

In other faculty news this year, Nara Parameswaran was promoted to professor. His research interests focus on understanding the cellular and biochemical mechanisms involved in the pathogenesis of inflammatory diseases. Eran Andrechek was promoted to associate professor. His research focuses on the mechanisms involved in the development and progression of breast cancer. His work focuses on understanding the heterogeneity of tumors and the potential for selective tumor-specific treatment.

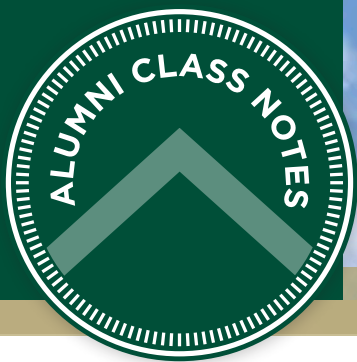
MSU has kicked off Empower Extraordinary, a \$1.5 billion capital campaign designed to further increase the university's research excellence and educational quality. Within the physiology department, our priorities for this campaign focus on the training of graduate and undergraduate students in cutting-edge research laboratories, and on the recruitment and retention of outstanding faculty members. To this end, we seek endowments to create research and travel funds targeted to students to facilitate their research and allow presentation of their exciting findings/discoveries at national/international meetings. We also seek to establish named chair positions for outstanding faculty that will allow recognition and flexibility for higher-risk novel research that may lead to creative discoveries within biomedical sciences.

Our alumni are important to us, and we want to hear from you. I encourage all alumni, donors and friends of physiology to keep in touch with department news by visiting our website (<http://www.psl.msu.edu>). I also encourage you to contact me directly with your questions, comments and suggestions.

In the meantime, I hope you enjoy our newsletter and, as always, thank you for your continued support and generosity. 🍷



C. Lee Cox, Ph.D.  
Chair  
Department of Physiology



**Bridget Pearce, M.D.**, physiology, '81, is an assistant professor in the Department of Anesthesiology, Division of Pediatric Anesthesia, at the University of Michigan in Ann Arbor.

**Mary (Klemens) Clifton, M.D.**, physiology, '91; M.D., '95, has started a new company, Get Waisted, that helps people lose weight through the adoption of healthier eating habits.

**Christopher Tracy, M.D.**, physiology, '98, recently completed a tour of duty as surgeon for the 1-32 Infantry Battalion of the 10th Mountain Division in the Wardak province of Afghanistan. Since returning stateside, he was assigned to the Walter Reed National Military Medical Center in Bethesda, Md., as the associate program director for rheumatology.

**Nate Brady, D.O.**, physiology, '01; D.O., '05, was recently nominated as a top doctor in allergy for Colorado Springs, Colo., the second year in a row he has received this honor. Nate and his wife, Jen, welcomed their third child, Asher Steven Brady, in Oct. 2014.

**Stacy (Swistak) Frye, M.D.**, physiology, '01; M.D., '07, is currently working at McLaren Flint as a pediatric sports medicine and orthopedics physician.

Recently  
started a new job,  
moved or received an award?

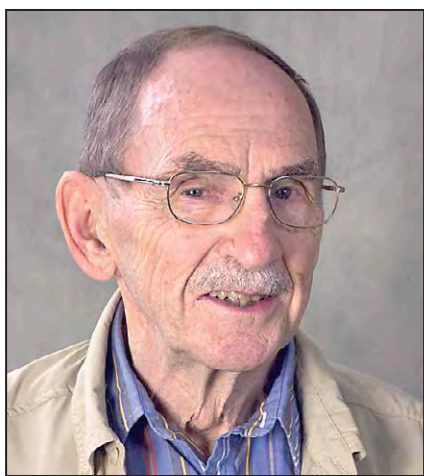
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[natsci.msu.edu/alumni-update](http://natsci.msu.edu/alumni-update)  
and we'll share it with  
students and alumni.

She was also recently named to the "Best Doctors in Michigan" list by *MetroParent*, and nominated for the 2015 Health Professional Hero Award given by the Grand Blanc Chamber of Commerce.

**Richard Schneeberger**, physiology, '08; human biology, '09; M.A. teaching and curriculum, '13, is the science curriculum director and department chair for Cornerstone Health + Technology High School in Detroit, Mich. He previously served as the high school's science rigor manager and was a 2011 recipient of the Woodrow Wilson Teaching Fellowship.

## In Memoriam



Professor Emeritus **Rudy Andrew Bernard** died January 17, 2015, at age 84. Bernard earned a Ph.D. from Cornell University and completed postdoctoral studies at the University of Wisconsin, Madison. He came to Michigan State University in 1969, teaching physiology and conducting research that focused on human brain function. In later years his interdisciplinary research was focused on motor control with an emphasis on internally generated movement. After transitioning to professor emeritus status, he continued to teach and pursue research until his death. He was devoted

to his students and never lost his passion for research, teaching and mentoring. He is survived by his wife, Nancy, two sons and a daughter. Bernard was a longtime member of St. John Church/St. Thomas Aquinas Parish. Contributions in Bernard's memory can be made to the MSU College of Music, Music Building, 333 W. Circle Dr., East Lansing, MI 48824; or to St. John Church and Student Center.

## Contact Us

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Photographs courtesy of: Harley Seeley; John Robert Williams Photography, Traverse City, Mich. (page 5); and the MSU Department of Physiology.



## Faculty Honors

**Erica Wehrwein**, assistant professor, received a Faculty Teaching Prize at the College of Natural Science annual awards presentation in November 2014.

The awards are made to fixed term and tenure system faculty in recognition of excellent teaching.

Four Department of Physiology faculty members were recipients of 2015 Faculty Awards from the MSU College of Human Medicine (CHM), where they hold joint appointments:



*Wehrwein*



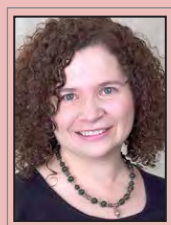
*Uhal*

**Bruce Uhal**, professor, received the CHM Distinguished Faculty Award for outstanding total service to the college and the university.

**Eran Andrechek**, associate professor, received the CHM Teacher-Scholar Award, which recognizes faculty who, early in their careers, have earned the respect of students and colleagues for their devotion to and skill in teaching.



*Andrechek*



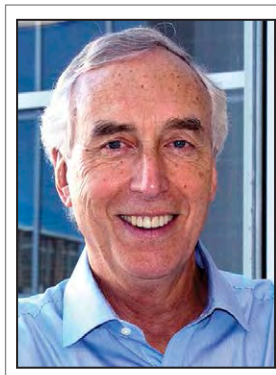
*Gallo*



*Spielman*

**Kathy Gallo and William Spielman**, both professors, received Mentor Recognition Awards for successfully guiding students on their academic or non-academic career path.

## Retirement



*Kreulen*

After a long and distinguished research and teaching career, **David L. Kreulen**, professor of physiology, retired August 16, 2015. He served as interim department chair from 2011-13 and held a joint appointment in the MSU Department of Neurology and Ophthalmology. Kreulen came to MSU in 1998 after serving as chair and the E. J. VanLiere Professor in the Department of Physiology at West Virginia University. He received his Ph.D. in physiology and pharmacology from Wayne State University in 1974. His research focused on properties of sympathetic ganglia and relationships of characteristics of individual neurons to the regulation of the cardiovascular and gastrointestinal systems. As interim chair, Kreulen contributed to many positive changes in the physiology department including hiring four tenure-stream faculty, enhancing laboratory facilities and technology, and serving as a mentor to all physiology faculty.

"I leave MSU with fond memories and with immense gratitude for the many exceptional colleagues and students who enriched my career," Kreulen said.

## New Faculty

The Department of Physiology welcomed three new faculty members since its last newsletter.



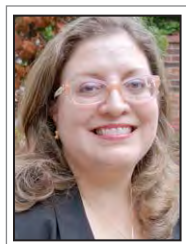
*Das*

**Rupali Das** joined the department in August as an assistant professor specializing in immunology, especially research in cancer and cellular immunotherapy. She comes to MSU from the Children's Hospital of Philadelphia where she has been a senior research associate in the division of oncology since 2013. At Children's Hospital she led a team to design and execute in vitro and in vivo anti-cancer activity of human invariant natural killer T (iNKT) cells and actively investigated the biological relevance and clinical importance of SLAM family receptors in the regulation of mouse and human iNKT cell functions. Das received her Ph.D. in immunology from the University of Arkansas for Medical Sciences.



*Subramanian*

**Hariharan Subramanian** joined the department in August as an assistant professor also specializing in immunology. He comes to MSU from the Department of Pathology at the University of Pennsylvania School of Dental Medicine, where he was a research associate and postdoctoral fellow in the laboratory of Dr. Hydar Ali since 2009. He is interested in establishing a research program directed toward discovering and developing novel strategies to target mast cells and prevent allergic asthma. Subramanian received his Ph.D. in biological sciences from the University of Wisconsin in Milwaukee, Wisc.



*Colon-Berlingeri*

**Migdalisel Colon-Berlingeri** joined the department in September 2014 as an assistant professor and is serving as a key faculty instructor at the MSU College of Human Medicine's Grand Rapids campus. She comes to MSU from the Biology Department of the University of Puerto Rico, where she was an associate professor, REU program director and an investigator for a curriculum improvement MARC-NIGMS supplement grant. Colon-Berlingeri received her Ph.D. in cellular and molecular pharmacology from UMDNJ-Rutgers University in Newark, N.J.

# Investigating promising treatments for depression, drug addiction

New treatments may be on the horizon for individuals affected with drug addiction or depression. A.J. Robison, assistant professor in the Department of Physiology and the Neuroscience Program, is studying these often-related issues in his lab—with promising results.

A past project in the Robison lab focused on the role of a particular transcription factor, a protein known as  $\Delta$ FosB, in the nucleus accumbens region of the brain (the “pleasure center”) and how it relates to the rewarding effects experienced by drug use. In more recent research, Robison’s lab is investigating how  $\Delta$ FosB regulates gene expression in the hippocampus (the part of the brain important for learning) in response to cocaine, and how that affects the associations made between the drug and the environment in which it is used.

“One thing that makes cocaine an insidious drug—and this is true of heroin and other addictive drugs—is that users form

*“Our goal is to advance and design . . . novel treatments [for drug addiction and depression] in the long run.”*

indelible, strong associations between the drug and the context in which they use the drug,” Robison said.

The research team wants to determine how exposure to cocaine and the formation of those associations alter gene expression in the hippocampus.

Another study being carried out in the Robison lab involves depression

and the mechanism of the action of antidepressants. In collaboration with the Viral Vector Core at MIT, Robison’s team has developed a new technology to investigate just how  $\Delta$ FosB works.

This new technology will enable researchers to determine which connections in the brain  $\Delta$ FosB is modulating, and how those connections then regulate a specific depression phenotype or response to antidepressant treatment. It will help them understand which exact circuits underlie the problems with depression and devise means for manipulating those specific circuits, which could lead to more individualized and more targeted treatment plans.

“This is important because most of the current treatments for depression are systemic—drugs are taken orally or by injection—and they affect the whole body and the whole brain. Yet, fewer than 50 percent of patients have good responses to traditional antidepressant treatment,” Robison said.

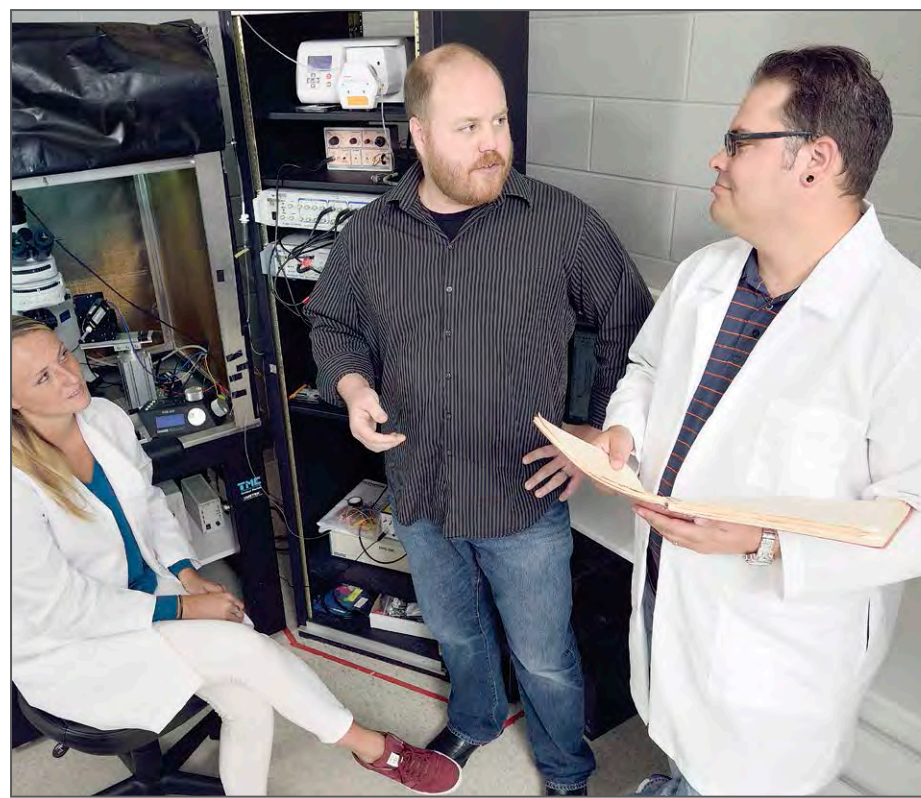
The medical field is just beginning to develop more targeted treatments for depression, such as deep-brain stimulation, which involves placing electrodes into select regions of the brain.

“But this is very invasive, and it doesn’t work in all patients,” Robison said.

“If we can develop a real mechanistic understanding of how some of these kinds of depression occur, we may be able to develop a much more targeted means of treating certain aspects that are predominant in one person’s depression versus another’s. This could lead to much less invasive, and much more effective, means of treating the disease.”

Robison is careful to point out that his lab is not developing a “cure” for depression.

“We are trying to understand the etiology of the disease and the mechanism of the disease, as well as the mechanism of how current antidepressants work. Our goal is to advance and design those novel treatments in the long run.”



Mackenzie Thibault (left), a neuroscience senior, listens as A.J. Robison, assistant professor in the Department of Physiology and the Neuroscience Program, discusses brain circuitry involved in memory and reward with Andrew Eagle (far right), a postdoctoral fellow.



## Mary and Craig Rosenberg: Supporting “an inspirational place”

A neonatal intensive care and maternity registered nurse, Mary Rosenberg (B.S., physiology, '82) works 12-hour shifts caring for newly born infants—many of whom have special needs—and educating their parents.

“It can be very intense,” she said. “Some of the babies are born addicted to drugs or have other issues. My goal is to give the parents enough support and information so they can go home feeling confident and knowing where to get help if they need it.”

Rosenberg loves her job and said she can't imagine doing anything else. But when she first enrolled at MSU, she envisioned a very different future for herself.

“I applied to vet school, but wasn't accepted,” she explained. “I considered med school but didn't pursue it and got my degree in physiology. After graduation, I worked in an environmental chemistry lab for 10 years or so doing bioremediation in Traverse City. When the cleanup project was finished, I was out of a job. So 10 years ago I became a nurse.”

***“If our donations can help someone, open a door for a person or improve or change someone's life, then that's very gratifying.”***

Her husband, Craig (B.L.A., landscape architecture, '85), had a similar, somewhat circuitous route to his current position as a portfolio manager/financial advisor for The Peninsula Group at Morgan Stanley. Originally an economics major at Kalamazoo College, Craig transferred to MSU nine months after meeting Mary while she was visiting a friend at



Craig and Mary Rosenberg

K-College. When he finished his landscape architecture degree, the couple moved to Colorado where both initially struggled to find jobs.

“I was laid off two or three times in about a year and a half,” Craig explained, “and had gotten to know a couple people at a local investment firm. I thought the work was interesting and I had some background in economics, so I started working there and very much enjoyed it. I use my landscape architecture degree at home.”

Both Rosenbergs always intended to support MSU when they were able and both make donations of time as well as money. Craig is president of the Grand Traverse Area Alumni Club and Mary is a College of Natural Science Capital Campaign volunteer. She's also becoming more involved in the alumni club.

“MSU is a very inspirational place,” Mary said. “I don't think the public sees how much the university contributes to business, to knowledge, to technology development.”

Part of Mary's loyalty to and appreciation of MSU was kindled by Keith Demarest, a former pharmacology and physiology professor who now works for Johnson & Johnson.

“I was cleaning rat cages to make some extra money and trying to decide what I wanted to do after I didn't get into vet school,” Mary said. “Dr. Demarest took me under his wing and gave me the opportunity to do research. I published a paper with him. He went above and beyond what was required. So I want another student to have that same opportunity—to have a professor reach out to them and show them all the interesting things there are to do at MSU. The knowledge that our donations are supporting that is very gratifying. We're supporting what we believe in.”

“I echo what Mary said,” Craig added. “If our donations can help someone, open a door for a person or improve or change someone's life, then that's very gratifying.”

# Physiology department leads Beckman Scholars Program

MSU's Beckman Scholars Program (BSP) is so effective that the undergraduate students involved are sometimes mistaken for postdocs, based on their impressive presentation skills and knowledge about their subject areas.

Laura McCabe, professor of physiology and radiology, and director of the MSU Beckman Scholars Program, said the goal of the scholarship program is “to provide top NatSci students with an intensive interdisciplinary research experience, combined with one-on-one faculty mentoring.” With leadership from the Department of Physiology, the program has accomplished that—and more.

***“Students will know how to integrate into labs in the future, work with others and do ‘team science.’”***

In February 2014, MSU was selected as a host institution for BSP, a highly sought-after invited program for accredited universities and four-year colleges in the United States. High-achieving students in the sciences are invited to apply for the scholarship at the end of their sophomore year, and must have prior research experience. Two or three students are selected each academic year. To date, five students in the College of Natural Science have been named Beckman Scholars (see sidebar), and faculty in the Department of Physiology continue to lead the program in a positive direction.

MSU's BPS integrates four research areas: Molecular Metabolism and Disease (MMD); Enterics Research Investigational Network (ERIN); Evolution and big data sets (BEACON); and Neuroscience. Each



Laura McCabe (left), professor of physiology and radiology, and director of the MSU Beckman Scholars Program, and Julia Busik, associate professor of physiology, are the faculty mentors for the 2015-16 Beckman Scholars.

student selects an area of research and a faculty mentor; 10 faculty members are currently involved.

“The idea behind having these four diverse groups is so students can observe scientists from various disciplines interacting and working together,” McCabe said. “Students get to see a broad range of approaches from an interdisciplinary aspect, so they will know how to integrate into labs in the future, work with others and do ‘team science’.

“When we select faculty mentors,” McCabe added, “we look for individuals who have a track record of outstanding mentorship, excellent student publications and outstanding research funding.”


One of those top faculty mentors is Julia Busik, associate professor of physiology.

“My undergrads are doing research. They really contribute,” Busik said. “The Beckman Scholars understand that this is not just coming into a lab to work for a couple of hours and be told what to do; this is their project, and they need to go out and find all the resources they can.

“The BSP is a training grant,” Busik added. “It’s important to have this kind of money,

and the Beckman Scholars feel good about being funded.”

“I meet with the BSP students almost every week,” McCabe said. “Each student tells the group what they’re doing in the lab. It’s great to see them develop and know their research well enough to be able to talk to others about it.”

For more about the Beckman Scholars Program at MSU, visit: <https://natsci.msu.edu/students/undergraduate/beckman-scholars-program/>. 

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## 2015-16 Beckman Scholars

Sanna Fraleigh, a physiology major from Ann Arbor, Mich.; and Kiera Fisher, a biomedical laboratory science major from Kalkaska, Mich.

## 2014-15 Beckman Scholars

Rebecca Cass Benjamin, a neuroscience major from Webberville, Mich.; Jacob Gibson, a biochemistry and molecular biology major from Spring Hill, Fla.; and Sarah MacLachlan, a zoology major from Pittsburgh, Pa.

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# Cancer research advances personalized medicine approach

Ongoing research in an MSU physiology lab is advancing a personalized medicine approach for breast cancer treatment and could ultimately lead to a cure.

Last year, Eran Andrechek, associate professor of physiology, along with Ph.D. student Dan Hollern and others, analyzed 1,172 mouse mammary tumor samples from 26 different preclinical models and were able to compile one of the largest mouse databases to show which strains of mice were best suited to study a particular type of human breast cancer.

"We found that the vast majority of human breast cancers can be represented by one of the strains we studied," Andrechek said.

"There are definitely clear parallels between mice and men in relation to breast cancer and this study provides legitimacy to using these models so ultimately a cure can be found," he said.

His lab's current project builds on that previous work.

"We took the data we collected from the previous study and are analyzing it to make predictions," Andrechek said. "This is the work of Jon Rennhack, one of the newer graduate students in the lab.

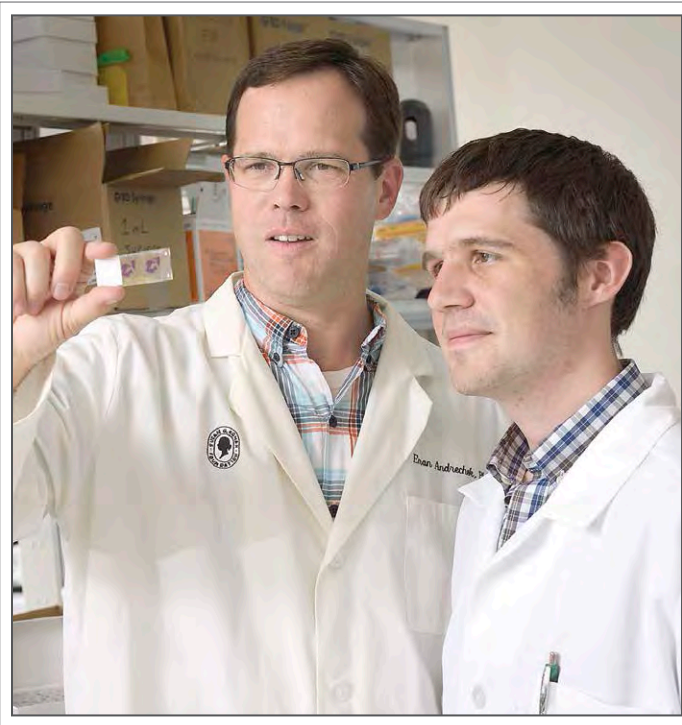
"One example is HER2 positive human breast cancer. Around 25-30 percent of human breast cancer is HER2 positive—which means there is an amplification of the HER2 gene," Andrechek said. "Jon

has identified regions of the genome in these tumors that are amplified or deleted—using computational methods. We found that these amplification and deletion patterns very much correlate with what the specific tumor physically looks like."

The next step is to transfer this data into an online searchable resource.

"We'd also like to take many of the models we've been studying and do whole genome sequencing. This would help us determine which type of human breast cancer has specific genes that are mutated; and if we want to study a particular kind of human breast cancer, there is a correlating mouse model that best mimics that type of human breast cancer."

In related work, Jing-Ru Jhan, a Ph.D. student in Andrechek's lab, is using the bioinformatics techniques from the original research project to study the efficacy of various drug combinations in mouse models.



Eran Andrechek (left), associate professor of physiology, and Jonathan Rennhack, Ph.D. student, examine a section from a tumor sample.

"We found that the drugs, individually, didn't have any effect on the tumors; they kept growing," Andrechek explained. "But when we put the drugs together, the tumors either stopped growing, or shrunk.

"This is really a personalized approach," Andrechek said. "We can look at the tumor and say, 'This is the therapy that ought to work for this tumor.' And it's working nicely." 📌

## Student Honors

Ryan Mui, a D.O./Ph.D. student in James Galligan's lab, received a two-year fellowship from the American Heart Association to support his research project, which focuses on sympathetic regulation of obesity and salt sensitive hypertension.

Hillary Woodworth, an M.D./Ph.D. student in Gina Leininger's lab, has received a Ruth L. Kirschstein National Research Service Award F30 Predoctoral Fellowship from the National Institute of Diabetes and Digestive and Kidney Diseases. Woodworth has been

investigating neural mechanisms of feeding behavior and energy expenditure, and how these circuits contribute to the regulation of body weight.

Three physiology graduate students received presentation awards since the last newsletter. They are: **Derrick Feenstra** (Mohr lab), Hot Topic Poster Award, Association for Research in Vision and Ophthalmology; **Michael Steury** (Parameswaran lab), Poster of Distinction Award at the Experimental Biology Conference in Boston; and

**Hillary Woodworth** (Leininger lab), Presidential Poster Competition winner at the Endocrine Society Meeting. Woodworth also received the Endocrine Society's Outstanding Abstract Award.

In addition, two physiology undergraduate students received awards. **Thomas Mayer** (Leininger lab) received the 2015 Michigan Physiological Society Poster Presentation Award; and **R. J. Vanderkamp** (Gulbransen lab) received the American Physiological Society's David S. Bruce Excellence in Undergraduate Research Award.

## Alumni event inspires attendees and presenter

### *Fabulous! Amazing! Fascinating!*

These were just a few of the sentiments from MSU alumni, friends and guests who attended the increasingly popular Classes Without Quizzes, offered by the College of Natural Science this spring. The enthusiastic support for the program was also shared by the event's presenters, including Gina Leininger, assistant professor of physiology.

"It was an honor to be part of Classes Without Quizzes and to meet so many Spartan science alums; they were such an enthusiastic and attentive audience," said Leininger, whose research presentation was entitled "Genes that Control the Size of Our Jeans," and included information on how neurons in the lateral hypothalamic area (LHA) of the brain may contribute to obesity and a lack of a desire to move around.

"The LHA is a crucial area of the brain for regulating feeding, drinking, sleep and locomotor behaviors that directly affect weight," Leininger explained. "We believe there are neurons in this

particular part of the brain that are activated by stimuli that cause you to eat less but move more. If we activate those neurons, we can suppress the desire to eat but increase actions to move around. If we could perpetuate that, it would promote weight loss."

After her presentation, many attendees approached her and told stories of how they, or a family member or friend, had struggled with weight loss.

"It's an issue that touches nearly everyone these days, and people are genuinely concerned about it," said Leininger, who holds a joint appointment in MSU's Neuroscience Program.



Assistant Professor Gina Leininger is studying the brain in hopes of finding clues to controlling obesity, which has risen to epidemic levels in the past 30 years.

Their stories provide further inspiration for her.

"I want to work even harder to understand how the brain regulates body weight, in hopes of finding therapies to support sustainable weight loss," she said. 🍀