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CAFNR Office of Research Newsletter // August 1, 2019 // 1(12)

Research Highlights



Keeping Crops Healthy »

Novel camera system could provide cost-effective way to monitor crop temperatures, MU researchers find

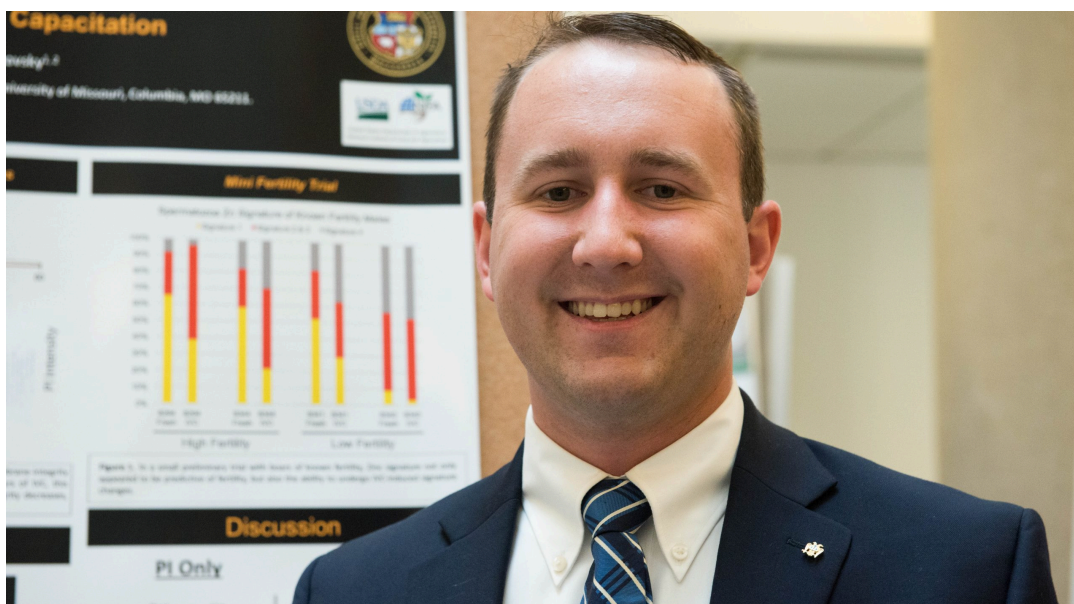
Agricultural Research Centers

Research Center Field Days »

The University of Missouri College of Agriculture, Food and Natural Resources' (CAFNR) Agricultural Research Centers are spread throughout the state and conduct research on everything from cattle genetics to soybeans to pawpaws. The Research Centers represent the uniqueness of agriculture in Missouri. With fertile soil, the Fisher Delta Research Center, located in the Bootheel region, studies rice and cotton. In the northwest part of the state, the Graves-Chapple and Hundley-Whaley Research Centers research best management practices for corn and soybeans. At the Horticulture and Agroforestry Research Center, in central Missouri, multiple disciplines are explored, such as plant pathology and agronomy. To showcase the endless research taking place at each Research Center, there will be numerous Field Days during the next several months.

- Greenley Research Center: Tuesday, August 6 – [A Trio of Topics](#)

Graduate Student Spotlight



Karl Kerns, USDA NIFA fellow

USDA-NIFA Predoctoral Fellowships provide \$165,000 in funding for research over two years. The focus of the program is to prepare the next generation of agricultural scientists by developing their technical and academic competence as well as the ability to independently synthesize ideas and perform research. Each applicant must write a six-page grant that outlines four different plans: a training and career development plan, a mentoring plan, a project plan, and an evaluation plan.

What is your fellowship project?

As part of my PhD training under Dr. Peter Sutovsky, we revealed that zinc ions play a major role in sperm fertilization competency, with our signature findings published in Nature Communications last spring. This process, called sperm capacitation, was first discovered in 1951, yet is among the largest knowledge gaps in the field of fertilization biology and early embryo development. Adding two additional postdoctoral fellow mentors, Drs. Susanta Behura and Dong Xu, we have started work to fill in these knowledge gaps and form a male fertility predictive algorithm by combining machine learning and bio-image single-cell phenotyping. From a livestock producer standpoint, reproductive performance is very important; adding one additional piglet/litter is a \$130 million opportunity cost for U.S. pork producers and the annual cost of infertility to the U.S. cow herd is \$4.7 billion (while sire fertility is not the only problem, it

is part of the equation). With the increased interest in precision agriculture, the advent of sire fertility predicting algorithms is necessary. Further, as sires sell for increased values (e.g. latest world record bull was sold for \$1.51 million), the need for improved male fertility diagnostics is essential. While not being directly studied, the results from the project could help diagnose couples suffering from infertility (1 in 8 couples, CDC), where women are sometimes incorrectly diagnosed with sub/infertility because male fertility diagnostic methods are lacking. This project is in collaboration with U.S. pork producers as well as Embrapa Brazil.

What is your research focus?

My broad research focus/big-picture biological question is this: what predestines *the* fertilizing spermatozoon?

Why does this field interest you?

1. While reproductive physiology is a vastly studied area in the U.S., most research focuses on female reproductive physiology and there are large knowledge gaps within male reproductive physiology. This means there is lots of low-hanging fruit that can be very impactful to U.S. farmers and, let's be honest, job security.
2. It combines the use of advanced analytic approaches to answer questions in a One Health mindset.
3. I find performing research in the light of centuries-old dogmas fascinating.
4. Studying the moments just before new life is formed is marvelous and awe-inspiring.

Why did you decide to come to Mizzou?

Mizzou is a powerhouse and looked at as one of the premier universities for a full-fledged reproductive physiology program. Further, the collaborations across campus for advanced analysis approaches (bioimage analysis and machine learning) through my collaborating mentors' labs help take my research and training to the next level, putting me at the intersection of molecular physiology and machine learning. It was an easy decision.

Who is your advisor?

Drs. Peter Sutovsky, Susanta Behura and Dong Xu

What are your future career plans?

Become a tenure-track professor with research focus as well as create startup companies with licensed university intellectual property to move discoveries into the field.

Research Roars

CAFNR research included in NIFA annual report

The [National Institute of Food and Agriculture \(NIFA\) Annual Report](#) was published earlier this month. Research from the following CAFNR faculty was included in that report:

- Peter Sutovsky, page 7, Zinc Plays Vital Role in Animal Fertility
- Mengshi Lin, page 21, Detecting and Separating Chemical and Biological Contaminants
- Jerry Taylor, JaeWoo Kim, and Susanta Behura, page 25, Teaming Up to Stop a Worldwide Disease

CAFNR faculty members have received the following recent grants (*listed by Principal Investigator*):

Alba Argerich, Invertebrate Community Response to Substrate Augmentation, 7/1/2018 – 6/30/2020, \$58,500, Missouri Department of Conservation

Andrew Biggs, Cooperative Agreement MDC and Bradford, 6/16/2017 – 6/30/2020, \$25,000, Missouri Department of Conservation

Kaitlyn Bissonnette, Applied Management of Fusarium Head Blight in Missouri Soft Red Winter Wheat, 5/1/2019 – 4/30/2020, \$10,174, Agricultural Research Service

Felix Fritschi, Climate Adaptation and Sustainability in Switchgrass: Exploring Plant-Microbe-Soil Interactions across Continental-scale Environmental Gradients, 8/15/2015 – 8/14/2020, \$273,726, University of Texas Austin

Michael Gold, Integrating Agroforestry into Small Farm Production Systems, 7/1/2016 – 6/30/2021, \$959,302, Agricultural Research Service

Damon Hall, Collaborative Research: ABI Innovation: Improving High-performance Supercomputer Aquatic Ecosystem Models with the Integration of Real-Time Citizen Science Data, 3/1/2019 – 6/30/2020, \$11,329, St. Louis University

Antje Heese-Peck, Roles of Epsin1-dependent Clathrin-coat in Plant Immunity Against Bacteria, 8/1/2018 – 7/31/2020, \$210,637, NSF Division of Integrative Organismal Systems

James Kaufman, Biogas Digestion: Economic and Asset Assessment for Missouri, 7/8/2019 – 3/16/2020, \$84,049, Missouri Agriculture and Small Business Development Authority

Benjamin Knapp, Do Forest Health Issues in Oak Forests of the Eastern US Accelerate Compositional Shifts to non-Oak Species?, 7/24/2018 – 8/31/2020, \$36,680, Forest Service

Benjamin Knapp, Silvicultural Options for Improving the Quality and Composition of Mixed Bottomland Hardwood Forests of Northern Missouri, 7/1/2014 – 6/30/2020, \$37,390, Missouri Department of Conservation

Carol Lorenzen, Using Metabolomics to Predict and Guarantee Beef Flavor for the Consumer, 5/1/2019 – 5/31/2020, \$96,525, 8/1/2019 – 7/31/2023, National Cattlemen's Beef Association

Craig Paukert, Missouri Cooperative Fish & Wildlife Research Unit, 7/1/2019 – 6/30/2020, \$60,000, Missouri Department of Conservation

Jon McRoberts, Survival, Recruitment, and Movement Patterns of White-tailed Deer in Missouri, 7/1/2014 – 6/30/2020, \$157,426, Missouri Department of Conservation

Calvin Meeks, Field Trial to Evaluate RKN/RN Resistance, 5/1/2019 – 12/31/2019, \$30,392, Dow AgroSciences LLC

Ron Mittler, Leaf-To-Leaf Communication During Acclimation to Multiple Stresses, 8/1/2019 – 7/31/2023, \$551,298, NSF Division of Integrative Organismal Systems

Kelly Nelson, Task Order Project No. 4, 6/1/2019 – 5/31/2022, \$141,862, Agresearch

Rebecca North, Algae, Stench, and Death: Are Algal Toxins Present in Missouri Fish?, 6/18/2019 – 6/17/2020, \$21,085, US Geological Survey

Scott Peck, Proteomic Analysis of Wound-Induced Phosphorylation in Plants, 5/7/2019 – 3/31/2020, \$4,520, RIKEN

Randall Prather, Gene Therapy for Cystic Fibrosis Lung Disease, 6/1/2019 – 5/31/2020, \$58,262, University of Iowa

Jon Simonsen, Expanding Farming Benchmarking Results through Multi-state Collaborations and Mentoring, 9/1/2019 – 8/31/2020, \$499,957, National Institute of Food and Agriculture

Reid Smeda, Monsanto Service Order #112, 4/1/2019 – 3/31/2020, \$7,315, Monsanto

Reid Smeda, Monsanto Service Order #114, 5/1/2019 – 4/30/2020, \$19,950, Monsanto

Reid Smeda, Monsanto Service Order #115, 5/1/2019 – 4/30/2020, \$19,950, Monsanto

Reid Smeda, Monsanto Service Order #116, 5/1/2019 – 4/30/2020, \$19,950, Monsanto

Gary Stacey, Identification of Physiological Function and Signaling Pathway of eATP Receptor, 1/1/2018 – 12/31/2020, \$56,400, Gyeongsang National University

Gary Stacey, DORN1 Defines a New Family of Receptor Kinase Purinoreceptors (P2K), 8/1/2017 – 7/31/2020, \$294,890, NIH National Institute of General Medical Sciences

Peter Sutovsky, Linking Fertility-Associated Gene Polymorphisms to Aberrant Sperm Phenotypes, 9/12/2016 – 5/31/2020, \$249,428, NIH National Institute of Child Health and Human Development

Jinglu Tan, INFEWS: US-China – Modeling and Determination of Photosynthetic Water Needs and Development of Smart Irrigation Systems to Minimize Water and Energy Use in Food Crop Production, \$500,000, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems

Frank Thompson, Determining the effect of habitat management and landscape context on northern bobwhite (*Colinus virginianus*) juvenile survival, habitat selection and population demographics in southwestern Missouri, 7/1/2016 – 6/30/2020, \$48,300

Corinne Valdivia, Rural Small Business Recovery and Resilience to Natural Hazards: A Focus on Women and Minority-Owned Small Businesses, 6/15/2019 – 6/14/2022, \$98,911, Purdue University

Gary Weisman, Novel Role for the P2Y2 Receptor in the Autoimmune Disease Sjogren's Syndrome, 9/22/2016 – 8/31/2020, \$623,962, National Institute of Dental and Craniofacial Research

William Wiebold, Grape and Wine Institute FY20, 7/1/2019 – 6/30/2020, \$856,467, Missouri Department of Agriculture

Bing Yang, Genome-enabled Platforms for Yam, 12/1/2018 – 3/31/2020, \$165,038, 12/1/2018 – 3/31/2020, Iowa State University

Provided by the MU Office of Research

In the News

[Specialist offers tips for planting soybean as cover crops](#)

Farms.com

[MU tests will crush weed seed with farmer help](#)

Missouri Farmer Today

[Stockpile tall fescue for winter cattle feeding](#)

Morning Ag Clips

*The Horticulture and Agroforestry Research Center will host a **Tomato Day** on Thursday, Aug. 1, at the Center in New Franklin. The event will feature tomato tastings, demonstrations and presentations. Tomato Day will begin at 6 p.m. and run until 8 p.m. The event is free and open to the public.*



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