

BULLETIN

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Assistant Professors Receive NSF Early-Career Grants

New grants on campus are always good news, and this month the Office of Research and Sponsored Programs is particularly pleased to congratulate two of our assistant professors—**Hanna Terletska** and **Ryan Seth Jones**—for their new **Faculty Early Career Development (CAREER) grants** from the National Science Foundation (NSF). The organization describes its CAREER awards as the **“National Science Foundation’s most prestigious awards”** for early-career faculty.

These are the **first two CAREER grants ever awarded to faculty at MTSU**. NSF receives more than 50,000 competitive proposals for funding each year and makes about 12,000 new funding awards.

See FACULTY continued on page 4

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UPCOMING FUNDING OPPORTUNITIES

National Science Foundation: Improving Undergraduate STEM Education: Education and Human Resources (IUSE: EHR)

Deadline: Varies depending on track (February)

[nsf.gov/pubs/2019/nsf19601/nsf19601.htm](https://www.nsf.gov/pubs/2019/nsf19601/nsf19601.htm)

IUSE: EHR also seeks to support projects that have high potential for broader societal impacts, including improved diversity of students and instructors participating in STEM education; professional development for instructors to ensure adoption of new and effective pedagogical techniques that meet the changing needs of students; and projects that promote institutional partnerships for collaborative research and development. IUSE: EHR especially welcomes proposals that will pair well with the efforts of NSF INCLUDES ([nsf.gov/news/special_reports/nsfincludes/index.jsp](https://www.nsf.gov/news/special_reports/nsfincludes/index.jsp)) to develop STEM talent from all sectors and groups in our society.

U.S. DHHS, Health Resources and Services Administration (HRSA): Opioid-Impacted Family Support Program, HRSA-20-014

Deadline: April 13

grants.gov/custom/viewOppDetails.jsp?oppId=319617

This program supports training programs that enhance and expand paraprofessionals' knowledge, skills, and expertise and increase the number of peer support specialists and other behavioral health-related paraprofessionals who work on integrated, interprofessional teams in providing services to children whose parents are impacted by opioid use disorders (OUD) and other substance use disorders (SUD) and their family members who are in guardianship roles. Additionally, a special focus is on demonstrating knowledge and understanding of the specific concerns for children, adolescents, and transitional aged youth in high-need and high-demand areas who are at risk for mental health disorders and SUDs.

Award limit: \$600,000.

NIH Small Research Grant Program–R03

Deadline: Feb. 16

grants.nih.gov/grants/guide/pa-files/PA-19-052.html

The National Institutes of Health (NIH) Small Research Grant Program supports discrete, well-defined projects that realistically can be completed in two years and that require limited levels of funding. This program supports different types of projects including, but not limited to:

- Pilot or feasibility studies
- Secondary analysis of existing data
- Small, self-contained research projects
- Development of research methodology
- Development of new research technology

NIH Exploratory/Developmental Grant–R21

Deadline: Feb. 16

grants.nih.gov/grants/guide/pa-files/PA-19-053.html

The NIH Exploratory/Developmental Grant supports exploratory and developmental research projects by providing support for the early and conceptual stages of these projects. These studies may involve considerable risk but may lead to a breakthrough in a particular area or to the development of novel techniques, agents, methodologies, models, or applications that could have a major impact on a field of biomedical, behavioral, or clinical research.

Academic Research Enhancement Award (AREA)–R15

Deadline: Feb. 25, 2020

nigms.nih.gov/research/mechanisms/pages/area.aspx

The purpose of this Academic Research Enhancement Award (AREA) for Undergraduate-Focused Institutions is to support small-scale research grants at institutions that do not receive substantial funding from the NIH, with an emphasis on providing biomedical research experiences primarily for undergraduate students, and enhancing the research environment at these applicant institutions.

HERE TO HELP!

For assistance with finding and preparing for funding opportunities, please contact your ORSP pre-award specialist:

Samantha Cantrell

samantha.cantrell@mtsu.edu

615-494-8751

*Behavioral and Health Sciences,
Liberal Arts, Media and Entertainment,
Jones College of Business, Walker Library,
University College, non-academic units*

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*Basic and Applied Sciences,
College of Education*



Mary Ellen Sloane

FROM THE BIBLIOGRAPHER'S DESK

By Mary Ellen Sloane, Science Librarian

This is part 2 of 3

Welcome

All of us at the University consume and/or create scholarly works. The way we create and share new knowledge is changing rapidly due to many factors. This three-part series will briefly profile current initiatives and issues that impact research and the dissemination of research.

Retraction Watch

Center for Scientific Integrity. (2019). *Retraction Watch: Tracking retractions as a window into the scientific process*. Retrieved from retractionwatch.com

Lately it seems like research misconduct and fraud is reported in mainstream news more frequently, which erodes the public's faith in academia. Retraction Watch is a project of the Center for Scientific Integrity and maintains a database and blog of retracted research.

When (or if) the feeling of professional rubber-necking subsides, these cases reveal that every retraction, like every train wreck, is a unique circumstance. The reasons for retraction fall into some consistent patterns: plagiarism of article, concerns/issues about authorship, concerns/issues about results, duplication of image, unreliable data, fake peer review, error in analyses, error in methods, investigation by journal/publisher. It's also interesting to see the range of disciplines represented and the role of journals and publishers in investigating problematic publications.

This project is a good teaching tool and also helps practitioners become more aware of current issues in research ethics, transparency, and accountability. Search the Retraction Watch database at: retractiondatabase.org.

You may share your comments with me at maryellen.sloane@mtsu.edu

GRANT WRITING ENHANCEMENT PROGRAM

Thank you to the following individuals for submitting your Professional Development Plans over winter break:

Rafet Al-Tobasei, Jessica Arbour, Bonnie Barksdale, Sarah Brant-Rajahn, Donna Dopwell, Elizabeth Dyer, Emmanuel Rowe, Kim Evert, Alisa Haas, Jessica Hejny, Kristi Julian, James Loveless, Kishor Luitel, Keely O'Brien, Rebecca Oldham, Carrie Pavel, Tiffany Rogers, Amanda Swenson, and Blake Whitman

WORKSHOPS AND TRAINING

The ORSP campus training schedule for the 2019–20 academic year includes these upcoming workshops:

February: U.S. Fulbright Scholar Program

March: Scholarship and Cybersecurity

April: Intellectual Property, Technology Transfer, and Commercialization

Summer: Working with Foundations

For details and to RSVP, visit:

mtsu.edu/ors/workshops.php

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NSF selects CAREER recipients based on their **“potential to serve as academic role models in research and education and to lead advances in”** their fields and organizations.

Solicitation: [nsf.gov/funding/pgm_summ.jsp?pims_id=503214](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214)

Hanna Terletska

Assistant Professor, Physics and Astronomy



The project summary for Terletska’s CAREER award begins: “This five-year career development plan is a fundamental research, education, and outreach program that focuses on

theoretical and computational study of functional quantum materials with strong electron-electron interactions and disorder. Much of our present knowledge of correlated electron quantum materials is built on studies performed for idealized and simplified toy models that do not take into account the intrinsic complexity of real systems. The overarching goal of the proposed research is to **enhance our understanding of quantum materials** by conducting beyond the ideal and more realistic model study of quantum systems, via inclusion of disorder, multi-orbital structure, and long-range Coulomb interactions.”

This is her second research grant at MTSU after submitting seven proposals as PI since joining MTSU in Fall 2018. Terletska was a Faculty Research and Creative Activity Committee (FRCAC) grant recipient in Spring 2018 for her research, “Computational studies of complex behavior in strongly correlated and disordered quantum materials.” She also is currently PI on another NSF-funded collaboration with colleagues at Louisiana State University and Carnegie Mellon University, titled “Collaborative Research: Element: Development of MuST, A Multiple Scattering Theory-based Computational Software for First Principles Approach to Disordered Materials.”

Ryan Seth Jones

Assistant Professor, College of Education



The project summary for Jones’ CAREER award begins: “Supporting Statistical Model-Based Inference as an Integrated Effort Between Mathematics and Science is a CAREER project with a

DRK-12 focus that seeks to design opportunities for mathematics and science teachers to coordinate their instruction to support a more coherent approach to teaching statistical model-based inference in middle school. There is a wide consensus that all students should have opportunities to develop a deep understanding of ideas and practices related to measurement, data, variability, and inference, but little is known about how to productively coordinate learning experiences across disciplinary boundaries of mathematics and science education. This is likely to create disconnected and incoherent learning experiences for students. This project will contribute to this problem by 1) creating **design principles...**; 2) generating **longitudinal evidence about how mathematical and scientific ideas co-develop...**; and 3) designing **four integrated units** that coordinate instruction across mathematics and science classes in sixth and seventh grade.”

This was Jones’ fourth grant proposal submitted as a PI at MTSU, and he has participated as co-PI on three other proposals, including one that was funded by the Tennessee Higher Education Commission, with Jennifer Lovett, Mathematics, titled “Engaging Students with Data Models.”



Stickle Shares Students' Porch Piracy Research

Ben Stickle, associate professor of Criminal Justice Administration, was invited to visit the Loss Prevention Research Council in December to discuss current research and future collaboration. The Loss Prevention Research Council (LPRC) is connected with the University of Florida and made up of "over 70 retailers and 75 solution partners who collaborate to develop effective loss and crime control solutions through extensive research" (lpresearch.org).

Stickle spent the day at LPRC (photo A), meeting with staff and LPRC Director Read Hayes, who is also a research scientist at the University of Florida. LPRC is on the cutting edge of applying technology and crime-prevention techniques to reduce a wide variety of crime at retail establishments.

The visit included a tour of the LPRC SOC Lab (photo B), Porch Piracy Lab (photos C and D), LPRC Ideation and Simulation Lab, and LPRC Research Lab, which "offers a unique place for our members to see the latest technologies and how they all work together to prevent and detect theft, fraud, and violence."

The LPRC has over 70 retail members (including Amazon, Best Buy, Lowe's, Walmart, Target, and others) and 75

solution partners. This visit provided an opportunity for Stickle to share current research efforts on package theft (porch piracy) by MTSU students Melody Hicks and Zachary Hutchinson and MTSU faculty members Stickle and Amy Stickle. The visit also served to enhance the relationship between LPRC and MTSU with the shared interest in reducing crime.



MARK YOUR CALENDARS!

On Friday, Feb. 21, the ORSP and the Honors College will host Kim Williams with the U.S. Fulbright Scholar program. Williams will visit MTSU to present two informational sessions—one specifically for students and one for faculty interested in the Fulbright program. Both sessions will take place in Honors 106.



Kim Williams

1–2 p.m. Student Presentation
2–3:30 p.m. Faculty Presentation

Williams also will offer a **limited number of 1:1 faculty sessions**, available on a first-come, first-served basis. One-on-one sessions are a great opportunity to ask specific questions about your programs of interest, gain feedback on your application, or talk through a reasonable timeline for application preparation.

Half-hour slots are available at 8:30 a.m., 9 a.m., 9:30 a.m., 10:30 a.m., and 11 a.m. Please email casey.penston@mtsu.edu to reserve your session.

In case you missed our January workshop, Working with Federal Sponsors, you can view it at mtsu.edu/ors/workshops.php

For details and to RSVP, visit: mtsu.edu/ors/workshops.php



STUDENT RESEARCH SPOTLIGHT

Lanjing Bao has been accepted to present his research titled “Mathematical Modeling and Optimal Control for Malaria Transmission Using Sterile Mosquitoes Technique and Insecticide-Treated Nets” at the 2020 Emerging Researchers National Conference in STEM in Washington, DC, on Feb. 6–8. Faculty mentor: Dr. Wandu Ding.

Bryce Massey traveled to Germany over winter break, alongside his faculty mentor, Kristi Julian (Human Sciences), to present at several conferences organized by Hochschulforum Digitalisierung (HFD) and the German Academic Exchange Service (DAAD). Massey presented at the **Strategies Beyond Borders: Transforming Higher Education in a Digital Age** conference and the **Virtual Exchange: Borderless Mobility between the European Higher Education Area and Regions Beyond** conference in Berlin. He

also presented at Hochschule Bonn-Rhein-Sieg University for the ProGlobe Project. Massey’s work stems from his IDES 4110 Residential Design II class, which focuses on advanced studio experiences in residential interiors with an emphasis on designing for special populations, sustainable design, and multicultural influences. Students in this class were all part of the **ProGlobe Virtual Exchange Conference** with the U.S., Germany, Canada, and Portugal. Faculty mentor: Kristi Julian.

Logan Rose presented her research titled “Mathematical Modeling and Optimal Control for Malaria Transmission Using Sterile Mosquitoes Technique and Bed Nets” at the Council on Undergraduate Research’s 2019 Research Experiences for Undergraduates Symposium in Alexandria, Virginia, in October 2019. Faculty mentor: Dr. Wandu Ding.

..... ★★★ Posters at the Capitol ★★★

Congratulations to the seven students to have been selected to represent MTSU at this prestigious annual statewide event!

On Feb. 26, these students will present their research to state legislators at the Tennessee State Capitol alongside undergraduate representatives from other participating state universities.



Aric Moilanen
"Taming Disorder in Quantum Materials"

Faculty Mentor:
 Hanna Terletska

Abstract: The discovery of new materials is a cornerstone of human civilization and development. We live in the era of quantum materials which offer tremendous opportunities for fundamental research and advances in new-generation technologies. Progress in this field will enable energy-efficient storage and transmission, faster and powerful electronic devices, novel sensors, and quantum computers. Such research can bolster economies, advance the quality of life, and address the unprecedented growth in global energy needs.

One essential part of such research is the accurate simulation and theoretical modeling of these materials. However, the very same properties that make these materials so useful also make them exceedingly difficult to simulate and understand. One major obstacle is understanding the effects of disorder, or imperfections, in a material. Disorder is ubiquitous in materials and can profoundly affect their properties and functionality. The focus of our research is how disorder turns a conductor to an insulator in a phenomenon known as the metal-insulator transition (MIT). Here, we propose a new, greatly simplified model for identifying MITs in a disordered system that both agrees with past simulations and significantly reduces computational complexity, bringing us one step closer to better modeling and control of properties of quantum materials.



Lillian Beck
"Correlation Between Mean Length of Utterances in Preschoolers and Different Maternal Education Backgrounds"

Faculty Mentor:
 Kathryn Blankenship

Abstract: The purpose of this study was to measure the mean length of utterances in typically developing preschool children and to identify whether maternal education is an influential variable in morphological development. The study also researched the relationship between mean length of utterance (MLU) and number of different words (NDW). Thirteen preschoolers between the ages of 3 and 5 were recruited to participate in the study. To participate in the study, each participant had to be typically developing in the area of language, nonverbal cognitive abilities, and hearing. This was assessed using standardized measures. Then, a 15-minute language sample was taken and was analyzed for MLU and NDW.

The results of this study showed that there was a medium correlation between MLU and maternal education and between MLU and NDW; however, statistical significance was not reached. The results suggest that as maternal education increased (e.g., mothers with higher levels of education) so did the length of MLU in the participants such that the participants from higher maternal education families had longer MLUs. Additionally, the results suggest that there is a relationship between NDW and MLU such that as the participants who had larger NDW had longer MLU.

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Jared Frazier
"Practical Investigation of Direct Analysis in Real-Time Mass Spectrometry for Fast Screening of Explosives"

Faculty Mentor:
Mengliang Zhang

Abstract: While the direct analysis in real time (DART) ionization source coupled with mass spectrometry (MS) is viable for the screening of trace explosives, current and previous methods have significant disadvantages for screening of explosives. This work demonstrates novel methods using DART-MS for the high-throughput and sensitive detection of 19 organic explosive residues in four different categories deposited on several substrates. Explosive residues were selected based on their use in historical bombings that have tragically claimed the lives of civilians and the armed forces of many nations. To combat the threat of explosives to national security, several methods were investigated using DART-MS.

The Quickstrip™ sample card method was used to optimize DART gas heater temperature as well as dopants. Four sample introducing strategies for DART-MS including transmission, thermal desorption, closed mesh, and direct-insert methods were implemented to analyze liquid and dried samples deposited on five substrates. Fabric, leather, metal, plastic, and synthetic skin were selected to simulate realistic matrices for explosive residues. It was found that representative explosives from each category could be detected with nanogram sensitivity and in less than 10 seconds. Therefore, the proposed methods using DART-MS provide prompt analysis of explosives for forensic applications.



Kayley Stallings
"Effect of Tea Brewing Temperature and Tea Concentration on the Microbial Profile of Kombucha"

Faculty Mentor:
Keely O'Brien

Abstract: Kombucha, a fermented tea made with a symbiotic colony of bacteria and yeast (SCOBY), has been touted as a health beverage for years. Previously, the health benefits attributed to kombucha have been primarily anecdotal; however, as kombucha consumption has increased, scientists are beginning to question what causes the supposed benefits, with many researchers attributing the advantages to kombucha's microbial ecosystem. Previous research examining kombucha produced with different types of tea demonstrated many variations in the microbiome. Therefore, manipulating the amount of tea used and the tea brewing methods may affect the microbiome of kombucha as well.

This study was conducted to determine how different kombucha production techniques—tea concentration and steeping temperature—alter the kombucha's microbiome. For this project, kombucha was made using varying concentrations of black tea and a range of brewing temperatures to determine if either had an effect on the microbial profile. The teas were fermented to the desired end-point and were then plated on selective agars to identify and quantify the types of microbes present. The results of this study will provide further insight into how different production practices affect the microbial profile of kombucha and how that might translate to the well-being of the consumer.

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The Office of Research and Sponsored Programs (ORSP) plans to offer the following campus training workshops for the remainder of the 2019–20 academic year.

February: Scholarship and Cybersecurity; Working with Tennessee Agencies

March: Entrepreneurship

April: Intellectual Property, Technology Transfer, and Commercialization

Summer 2020: Working with Foundations

For details and to RSVP, visit: mtsu.edu/ors/workshops.php



Lily Medley
"Geochemical and Petrographic Attributes of Lavas Erupted at Small Volcanic Centers in Northern Oregon: Implications for Magma Formation Within an Intra-Volcanic Arc Graben"

Faculty Mentor: Warner Cribb

Abstract: Quaternary volcanism in the northern Oregon Cascade Range is dominated by eruption of calc-alkaline andesite to rhyodacite lava flows and associated pyroclastic deposits at long-lived, subduction-driven composite volcanoes, such as Mt. Hood and Mount Jefferson. This study investigates small and more mafic Quaternary volcanoes in the Mt. Hood vicinity, including Clear Lake Butte (CLB), Pinhead Buttes (PHB), and Olallie Butte (OB). These volcanoes are located within an intra-volcanic arc graben, which developed approximately 7-8 Ma to the south and propagated northward to the Mt. Hood region.

The research objective is to identify geochemical and petrographic similarities and differences among intra-arc graben lavas in order to better understand the conditions of magma formation at small volcanoes in the central to northern Oregon Cascade Range. This research is a comparison of geochemical and petrographic characteristics of Quaternary basalt and basaltic andesite lavas erupted at small volcanoes within the northern graben to those of primary and near-primary lavas, mainly erupted within southern graben regions.



Tia Shutes
"Initiation and Cannabinoid Assessment of Trichomes on Industrial Hemp (*Cannabis sativa*) Tissue Callus"

Faculty Mentor: John DuBois

Abstract: Industrial hemp, *Cannabis sativa* L., is a species of the Cannabaceae family, used for many medical and industrial purposes, which centers on the cannabinoids of tetrahydrocannabinol (THC) and cannabidiol (CBD). These compounds are produced in trichomes (microscopic plant hairs), located

on the surface of the plant. The objective of this project was to initiate trichomes via callus of various industrial hemp varieties and assess the cannabinoid concentration within the trichomes. using high performance liquid chromatography (HPLC).

HPLC analysis of the callus produced from the Cherry, Cherry Blossom, and Cherry x Workhorse varieties showed promising presence of CBD. By successfully achieving this objective, researchers will have the ability to more effectively study trichome growth and cannabinoid production under laboratory conditions, which could ultimately lead to breakthroughs in future botany research and holistic medical discoveries.



Will Vest
"Mission Aid"

Faculty Mentor:
Jenna Gray-Hildenbrand

Abstract: This paper explores the unique case of Christian missionaries and how they relate to religious studies themes of community, motivation, and colonialism. A comprehensive look at missionaries and mission work is a culturally relevant topic to the 65% Christian-identifying America. Throughout the paper, foundational religious scholars' theories, like Emile Durkheim's theory of community, will be the analytical basis for observing Christian missionaries. The theory of moral community is a basis of looking at what defines community, and more broadly, religion as a whole.

Religious motivation is addressed as a rational for self-attitude and world-attitude. The more controversial theory of colonialism—and its relationship with mission work—is a critique levied by scholars onto the religious community. Using many diverse forms of information, such as religious scholars' theories, interviews with missionaries, and the verbal response of the communities that missionaries are working in, supports the conclusion that Christian missionaries are a motivated community that offers aid in response to a credal call to action.



Kym Stricklin,
Award Management
Specialist

When your sponsored project includes funds to hire an outside consultant, a purchase order through MT\$ource will be needed and a contract should be initiated well in advance of the planned start of the services. The purchase order will be generated upon execution of the contract for services. The University has a Professional Service Agreement template on the Contract Office website (mtsu.edu/contract) that your ORSP award manager can help you complete. Information needed to complete the agreement includes: contractor name (along with completed W-9 form); detailed description of service to be provided; rate and payment terms; maximum liability; start and end dates. Also, please bear in mind the time requirements for the procurement process.

TRAVEL SUPPORT FOR UNDERGRADUATE RESEARCH

The Undergraduate Research Center strives to support students in dissemination of their research. Undergraduates who are accepted to present their research at a regional, state, national, or international conference are eligible to receive travel funding. Support includes:

- \$400 yearly maximum for domestic travel and \$500 yearly maximum for international travel
- Awarded travel funds payable on a **reimbursable basis only**

Check out our website for more information:
mtsu.edu/urc/travel.php

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