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NSF Provides Funds for Major New Research Instrument at University

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NSF Provides Funds for Major New Research Instrument at University

New tool will help expand materials research, opportunities for Mississippi researchers

OCTOBER 21, 2020 BY SHEA STEWART



The acquisition of a Quartz Crystal Microbalance will assist engineering departments in disciplines that include chemical, biomedical, civil and agricultural/biological, along with the UM School of Pharmacy and the MSU Department of Geosciences. Photo by Thomas Graning/Ole Miss Digital Imaging Services

OXFORD, Miss. – The **University of Mississippi** will be home to an instrument essential to innovative materials development research, thanks to a Major Research Instrumentation award from the **National Science Foundation**.

The award is being used to purchase a Quartz Crystal Microbalance with Dissipation, a highly sensitive balance that can detect changes in mass at the molecular level using a quartz crystal, which registers minuscule deviations in frequencies and loss of energy.

The device will be housed at the university but be used as a shared device for researchers in Mississippi and the Southeast, with coordination from researchers at UM and Mississippi State University, who were co-principal investigators on the award.



Brenda Prager

“We are very happy the NSF could provide the funds for us to purchase this instrument,” said Brenda Prager, UM assistant professor of **chemical engineering** and principal investigator for the award. “This instrument will be used to dramatically improve research productivity from at least eight departments at UM and MSU.

“Fourteen different research groups also will immediately benefit from the incorporation of this instrument into their research activities, and up to 65 research students will learn new interfacial measurements using this state-of-the-art equipment.”

Between the two universities, the instrument will assist engineering departments in disciplines that include chemical, biomedical, civil and agricultural/biological, along with the UM School of Pharmacy and the MSU Department of Geosciences.

“With the Quartz Crystal Microbalance with Dissipation, researchers in Mississippi and throughout the Southeast can now access a state-of-the-art analytical instrument to enhance their current research efforts in their respective fields,” said Alexander Lopez, a UM assistant professor of chemical

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Students Learn ‘Real Politics’ in Washington, D.C., Winter Session

OXFORD, Miss. – Eleven University of Mississippi students spent their winter break learning about the people who work behind the scenes of the American government in Washington, D.C. Lead by Jonathan Klingler, assistant professor of political science, the students of Pol 391: Applied Politics met not with candidates, but with the people who make candidates’

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Young Alumna Gives Back to School of Accountancy

OXFORD, Miss. – Stephanie Jennings Teague, of Chicago, sees her commitment of \$100,000 to the Patterson School of Accountancy’s new building at the University of Mississippi as a means of saying “thank you.” “It is a way to show a small token of my appreciation to Ole Miss, the faculty and staff, and the accounting

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Reuters: Keep an Eye on the Money Supply

U.S. inflation roller coaster prompts fresh look at long-ignored money supply By Michael S. Derby NEW YORK – The amount of money sloshing around the U.S. economy shrank last year for the first time on record, a development that some economists believe bolsters the case for U.S. inflation pressures continuing to abate. The Federal Reserve’s

engineering and co-principal investigator on the award. "The instrument provides a powerful tool for researchers to study how molecules interact with surfaces with unparalleled precision."

Expected to arrive in the spring, the instrument, known as a QCM-D, will enable Ole Miss researchers to better compete on the world stage with innovative material developments while also sharing their work in publications and conference presentations, and lead to increased funding opportunities for research.

The device is used in fields such as drug capsule preparation, drug release considerations, multifunctional coating development for packaging applications, biofilm studies, formulations and end-product analysis of novel materials, and more.

"In all of these areas, there is a need to study behavior at the nanoscale or molecular level, and the QCM-D is sufficiently accurate and sensitive to enable such measurements at this very small scale," Prager said.

Prager's research interests are in developing new coatings to prepare innovative food-packaging for better longevity and protection of foods. Part of that research involves developing a highly water-repellent surface on coatings.

She's also pursuing a thermal barrier coating that is intended to protect packaged goods from harsh and hot environmental conditions often encountered during transportation in remote areas.

"For both these projects, it is highly important to understand exactly how the coating components interact with the cellulose substrates, and the QCM-D will enable me to determine the adsorption kinetics, the type of bonding and the viscoelastic development of the coating as it dries over the cellulose," said Prager, who [joined the UM faculty in 2015](#).

With the acquisition of the QCM-D, these research areas and more will be expanded as the instrument's innovative uses are shared with other institutions and industries in the Southeast.

Geoscience researchers at MSU study the geochemistry of waters and minerals at both macro and micro scales, said Rinat Gabitov, an associate professor in the Department of Geosciences and co-principal investigator on the award. The QCM-D will help them expand existing programs in this field of study.

Gabitov's research interests lie at the intersection of geochemistry and mineral growth, focusing on what minerals can tell us about the past and how they help in the removal of chemical pollutions from water.

"Mineral growth can take different paths through various steps as each step of these paths has its unique physical characteristics," he said. "The QCM-D allows the evaluation of many of those steps and, hence, provides information on crystallization paths.

"In particular, the QCM-D provides information on the character and the rate of mineral-water interaction, which is critical in evaluating of crystallization mechanisms and the way minerals retain hazardous components."

Beyond research at universities throughout the Southeast, the QCM-D also will be used by students in courses covering polymer science, biomedical microscopy, environmental geochemistry and more, along with various undergraduate research projects.

The instrument also will be used in outreach programs for kindergarten through 12th-grade students and college students to nurture further interests in science, technology, engineering and mathematics. Some of the programs where the QCM-D will be used for outreach purposes include mentoring high school students in a summer research program or Ole Miss students in the [Ronald E. McNair Program](#), using it to further student research through [the Summer Undergraduate Research Experience program](#), or engaging students at events such as Science Day at the UM Field Station.

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Alexander Lopez



This is the second time in less than three years that UM has received a **Major Research Instrumentation award**. Researchers from multiple schools and departments acquired a **field-emission scanning electron microscope** that is housed in the School of Pharmacy.

Titled "**Acquisition of a Quartz Crystal Microbalance with Dissipation Monitoring for Enhanced Research and Teaching of Interfacial Science in the State of Mississippi**," funds totaling \$185,486 for the QCM-D are provided by grant No. 2018004 from the NSF.

The other co-principal investigator on the award is Soumyajit Majumdar, professor of pharmaceuticals and drug delivery, associate director of the Pii Center for Pharmaceutical Technology and associate dean for research and graduate programs in the School of Pharmacy.

Soumyajit Majumdar

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