MU among schools to receive $20 million National Science Foundation climate grant

By Ashley Jost

The University of Missouri is one of several higher education institutions in the state that will participate in a $20 million, five-year, grant-funded program to study climate variability and the potential agricultural, ecological and social impacts those changes have on Missouri.

According to a news release, the “Missouri Transect: Climate, Plants and Community” project received the $20 million grant from the National Science Foundation. The grant benefits a team that includes all four UM System campuses, Washington University in St. Louis, Lincoln University and St. Louis University. The grant also includes the Donald Danforth Plant Sciences Center and the St. Louis Science Center.

John Walker, director of the division of biological sciences at MU and principal investigator for the project, said MU is the primary operator of the project. About $12 million of the project budget is associated with MU, though part of that money will go toward faculty that will work at other colleges and equipment that all partner institutions will use.

The grant funds five new faculty members across the state and at least one will work at MU. Walker said there will be three post-doctoral fellows at MU, about a dozen graduate students, two information technology employees and three staff members to help coordinate the project.

“Missouri’s economy is driven by our diverse natural and agricultural ecosystems, which are affected by climate variability,” Walker said in a news release. “The Missouri Transect project, which capitalizes on our state’s core research strength in the plant sciences, will model and predict short- and long-term changes in climate and determine the impact on these important plant ecosystems, as well as on the communities that rely on them.”

Each institution brings a unique expertise in plant sciences, atmospheric and environmental sciences and bioinformatics engineering, social sciences and science outreach and education. The project includes four interdisciplinary teams focusing on climate, plant biology, community resilience and education/outreach.
COLUMBIA — MU will provide expertise from science and engineering disciplines as part of a five-year study of climate change and its potential effects on agriculture, ecology and the community.

"We have people from a lot of different areas of expertise and a lot of different institutions throughout the state," said John Walker, director of MU’s Division of Biological Sciences and principal investigator of the project, "The Missouri Transect: Climate, Plants and Community."

The project is being funded by a $20 million grant from the National Science Foundation, according to an MU news release. The nine participating institutions include all four campuses in the University of Missouri System.

The funding is coming from the Experimental Program to Stimulate Competitive Research, started by Congress to support basic research, STEM — science, technology, engineering and mathematics — education and workforce development, according to the release.

Other participating institutions are: the Donald Danforth Plant Sciences Center, Washington University, Lincoln University, the St. Louis Science Center and St. Louis University.

The institutions will provide expertise in plant sciences, atmospheric and environmental sciences, social sciences, science outreach and education or bioinformatics engineering, which combines mathematics, science and engineering, the release said.

Four interdisciplinary teams make up the project: climate, plant biology, community resilience and education and outreach. MU will have people involved in each team, Walker said.
The interdisciplinary approach is important for the study because climate changes can impact communities on many levels, he said. For example, one approach is to study how plant systems are affected by variability in the climate; another approach is to understand how drought or flood may affect a community and how to plan and adapt.

According to the release, the project will support workforce development in three areas: undergraduate and graduate education; bioinformatics training for women, minorities and people with disabilities; and job training.

A related goal is to increase the state's research competitiveness by promoting STEM training and developing collaborations among institutions throughout the state as well as among the disciplines within the institutions, Walker said.

"I'm excited by getting to interact with areas I've never really studied myself," he said.

Missouri universities get $20 million for climate research

A number of Missouri universities will share a $20 million grant from the National Science Foundation to fund a five-year study on the variability of climate and its potential statewide agricultural, ecological and social impacts.

All four University of Missouri campuses will participate in the study along with Washington University, Lincoln University, the St. Louis Science Center and St. Louis University.

The study is being called “The Missouri Transect: Climate, Plants and Community. It will draw on each institution's research strengths centered around four broad subject areas, including climate, plant biology, community resilience and education/outreach.
John Walker, director of the Division of Biological Sciences at the University of Missouri-Columbia, said the project will “predict short- and long-term changes in climate and determine impact” on plant life and surrounding communities.

Hank Foley, senior vice chancellor for research at Mizzou, said the grant money should be a boost to the state’s research infrastructure and competitiveness.

“It also will provide opportunities to move research from the lab to the marketplace and thus spur innovation and entrepreneurship,” he said in a statement.

Research dollars, particularly from the NSF, are considered one of the most credible ways research universities have available to gauge their performance.

The thinking is that the amount of money an institution spends on research is a good indicator of the value it is providing to students. Research expenditures are also linked to academic growth and student achievement.

Missouri Institutions To Share $20 Million Grant To Study Climate Change

By Véronique LaCapra

The National Science Foundation has awarded $20 million to academic and research institutions across Missouri to study climate change.

Part of the NSF grant will be used to study the effects of drought on plants. This image shows leaves of the same species of plant, grown under normal and drought conditions. This image shows how an infrared scan can detect chemical changes in the drought-stressed leaf that are invisible to the human eye.

Five states, plus the U.S. Virgin Islands, have received one of the NSF’s Experimental Program to Stimulate Competitive Research (EPSCoR) grants.

In Missouri, the five-year grant will go to nine institutions, including five in St. Louis: the University of Missouri-Columbia; the Missouri University of Science and Technology in Rolla; the University of Missouri-Kansas City; Lincoln University in Jefferson City; the Donald Danforth Plant Science Center; Washington University; the University of Missouri-St. Louis; Saint Louis University; and the Saint Louis Science Center.
John Walker, a plant biologist at the University of Missouri-Columbia, is leading the statewide study.

Even though the project will produce scientific results and new technologies, he said, its main goal is to increase Missouri’s “research competitiveness.”

“We think we’re really going to be able to accomplish that,” Walker said. "Because we’re going to have collaborations and cooperations across the state that would normally not exist.”

Walker said researchers from different institutions will work together in teams focusing on climate, plants, human communities, and education. Projects will range from developing drought-tolerant crops, to helping communities respond better to climate change.

The Donald Danforth Plant Science Center’s Terry Woodford-Thomas, who is leading the education team, said one program will teach young women bioinformatics: how to use computers to analyze large, complex biological datasets.

It’s a field that doesn’t have a lot of women now.

“So we wanted to have an institute that was solely for young women, that would be taught by women who are experts in computer science,” Woodford-Thomas said. “And just make it a more friendly environment, a non-intimidating environment, for young women.”

Woodford-Thomas said another project will use citizen scientists to study the flux of carbon dioxide from soils.

‘Bottleneck’ still threatens black bears in the Ozarks

Efforts to stop the decline of black bears in the Ozark mountains should continue in order to ensure healthy populations, experts say.

Deforestation at the turn of the 20th century led to a loss of habitat for black bears in the Central Interior Highlands, an area that consists of Missouri, Oklahoma, and Arkansas. To repopulate the
mountainous region, more than 250 bears from Minnesota and Manitoba were relocated to Arkansas in the 1950s and 1960s.

To examine the genetic diversity of black bears in the region today, researchers collected and analyzed DNA samples from black bears from five geographical locations. Hair samples from Arkansas, Oklahoma, and Missouri were analyzed. Additionally, blood samples from hibernating bears in Minnesota and tissue samples from Manitoba were examined for their genetic signatures.

“The focus of our study was to determine the effects of the reintroduction of black bears in the Ozark and Ouachita Mountains and how that reintroduction affected population genetics in the region,” says Emily Puckett, a doctoral candidate in the Division of Biological Sciences at the University of Missouri.

“We also wanted to determine if we could find evidence of the population that was formerly here and whether or not they mated with the reintroduced bears or if they had gone locally extinct following deforestation.”

Cut-off populations

Previous study results suggested that black bears were present throughout the CIH in the 1920s, contrary to previous beliefs. The current research indicates the bears had a remnant lineage in the northern Ozarks of Missouri, Puckett says.

The team also found that current black bears went through a brief “bottleneck,” where bears were cut off from each other and genetic diversity was reduced. However, the team also determined that the reintroduction of bears to the CIH in the 1950s and 1960s helped to restore diversity and increase population size in the Ozarks and Ouachitas.

“We observed the genetic signature of the Ozark population from Arkansas in Missouri, meaning that the bears moved north,” says Puckett. “These bears bring with them their higher genetic diversity, which may help Missouri’s bear population in the future.

“The movement north also indicates that formerly fragmented forests may have regrown thereby connecting Missouri bears to the Ozark subpopulation that was further south.”

“This represented one of the largest sample sizes in a study of this type,” says Lori Eggert, associate professor of biological sciences. “By using multiple genetic markers on samples collected from Missouri and Arkansas, hunted bears in Oklahoma, and live dens in Manitoba, we were able to conduct genetic and statistical analyses to analyze trends and gain robust conclusions.”

The team suggests that conservation efforts to promote forest connectivity will help protect bears throughout the region, so that subpopulations are not isolated, as was the case in Missouri, and genetic diversity remains high.
“Geneticists get concerned when populations have low genetic diversity,” Puckett says. “Low diversity can be indicative of low population size. When harmful mutations arise in a gene pool with low diversity, they may increase in frequency leading to poor fitness and health in the population. That’s why these management suggestions are so important.”

The Missouri Department of Conservation, Arkansas Game and Fish Commission, US Fish and Wildlife Service, and Safari Club International supported the research. The study appears in the journal *Molecular Ecology*.

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**Fiendish, Million-Dollar Proof Continues To Elude Mathematicians**

Is a solution to one of the most important, beautiful and potentially lucrative problems in mathematics right around the corner?

Not long after Mukhtarbay Otelbaev of the Eurasian National University in Astana, Kazakhstan, last year proposed a solution to the fiendish Navier–Stokes equations, which carry a $1 million bounty, he acknowledged he had made a mistake. Now he says he is working to fix his proof, but some mathematicians do not think much of his chances.

The equations, devised by French engineer Claude-Louis Navier in 1822 and re-derived 23 years later by Irish mathematician-physicist George Gabriel Stokes, are used to model fluids such as air, ocean currents, blood and mucous.

The trouble is that no one has ever been able to prove that the equations don’t sometimes ‘blow up’ and produce physically impossible results. “Fluids are very important in science and engineering, but remarkably little is known about them,” says Charles Fefferman of the Princeton Mathematics Institute in New Jersey.

**Such a proof could lead to better aeroplane and boat designs, and improve weather prediction.** “This is the most beautiful problem I have ever worked on,” says Stephen Montgomery-Smith, a mathematician at the University of Missouri in Columbia, who has been tackling the equation since 1995. “It has opened my eyes to appreciating aspects of the real world.”

**Proof by forum**

As well as its practical implications, a solution is worth a significant reward. In 2000, the Clay Mathematics Institute in Providence, Rhode Island, called the Navier–Stokes equations one of
the seven most important puzzles in modern mathematics, and pledged $1 million to anyone who could solve these ‘Millennium Prize Problems’.

In 2006, Penny Smith of Lehigh University in Bethlehem, Pennsylvania, set blogs and online forums abuzz with an alleged solution that she posted to the preprint server arXiv. It later turned out to be wrong.

When news emerged in January 2014 that Otelbaev — a member of the Kazakh Academy of Sciences who has been working on the problem for 30 years — had published a proposed solution in the Russian-language *Mathematical Journal* the previous year (ref. 1), the international mathematical community took notice. With such a big breakthrough at stake, several mathematicians, including Terence Tao of the University of California, Los Angeles, who is also working on the problem, used online forums to try to verify his results.

Unfortunately, about a month later, they spotted a mistake, which Montgomery-Smith brought to Otelbaev’s attention.

“To my shame, on page 56 the inequality (6.34) is incorrect therefore the proposition 6.3 (p. 54) isn’t proved. I am so sorry,” Otelbaev wrote in an e-mail to Montgomery-Smith. “I didn’t use a right formula in one place to calculate the abstract theorem, so the subsequent calculation was wrong,” Otelbaev told *Nature*.

**Two-year wait**

Otelbaev has not given up, though. Just over a week ago, he said he hoped to publish a new, corrected proof soon: “I’m now fixing the mistake, and hope to have a complete, rewritten proof in about three months.”

Montgomery-Smith is cautious: “Most mathematicians think that a general approach like the one Otelbaev is trying will not work.” Tao, a recipient of the prestigious Fields Medal, says that as far as he knows, “nobody other than Otelbaev himself is continuing to try to salvage the argument”.

If Otelbaev does manage to correct his proof, he may have to wait for his prize money. The Clay Institute’s rules state that the work must remain unchallenged for two years before it is considered, and must be published in a journal of "worldwide repute". The institute declined to speak to *Nature* about the latest developments.

Only one Millennium Prize problem has been officially solved so far. In 2002, Russian mathematician Grigory Perelman proved the Poincaré conjecture, but refused the $1 million prize.

This story originally appeared in Nature News.
Catherine Rampell: Stop the campus rape numbers game

Catherine Rampell  •  crampell@washpost.com

**NO MU MENTION**

One in five? Yeah, right. Sounds way too high.

That’s a common reaction to the oft-cited statistic about the share of women who experience an attempted or completed sexual assault during college. The number can’t possibly be right, the Doubting Thomases (or, less frequently, Doubting Thomasinas) argue. It’s based on a small sample of schools, after all, and must not be representative of the full melange of colleges out there.

How about this, then? Let’s survey every campus and find out.

So proposes a bipartisan bill introduced by eight senators last week. The Campus Accountability and Safety Act would, among other things, create new transparency standards for U.S. colleges, requiring them to conduct anonymous, standardized, representative surveys about student experiences with sexual violence. The survey language and platform would be developed by the federal government, and results would be published in a centralized, user-friendly database — alongside other figures schools already report, such as tuition and retention rates, in exchange for participating in the federal student financial aid program.

This is a brilliant idea, if not a new one. For years, victims’ advocates have been recommending that schools pull their heads out of the sand and start measuring the true extent of the epidemic of sexual violence on their campuses. Colleges, alas, have been less keen on the idea. In the spring, a White House task force presented a similar proposal for such “climate surveys” that was fiercely opposed by several higher education industry groups. State legislators in Maryland also considered a survey mandate, but the state’s schools (including one under federal investigation for allegedly mishandling an assault complaint) helped kill the bill.

Colleges claim that administering such surveys is too onerous, and that the Clery Act already requires them to publish data on campus crime. But official crime numbers can be misleading, partly because the vast majority of sexual crimes go unreported. Victims feel ashamed, don’t know whom to contact or fear they will face
skepticism or harassment if they come forward. Schools also have a lot of discretion about what sort of crime statistics they publish, making apples-to-apples comparisons among schools difficult.

Most troubling, because there is so much incredulity about the prevalence of sexual assault, schools face perverse incentives to underreport incidents for fear of being seen as unusually dangerous even when their crime rates are merely average. It’s no wonder, then, that in response to a recent survey of 440 colleges commissioned by Sen. Claire McCaskill, D-Mo., 41 percent reported not having conducted a single investigation into sexual violence in the previous five years. These schools are probably proud that so few incidents appear worth investigating — but a low investigation rate is probably a sign not that campuses are crime-free but that victims aren’t seeking help. Or, worse, that administrators are not taking action when victims come forward.

A few brave schools voluntarily survey students about their experiences with rape, sexual assault and harassment. The University of New Hampshire, for example, has been conducting surveys for more than 25 years, and handfuls of other institutions have followed suit (some as a result of federal investigations into whether they have mishandled sex crimes in the past).

Many of the schools that do conduct surveys don’t publish the results, though, likely out of fear of negative publicity. My own alma mater, Princeton, surveyed students in 2008, but the findings were not made public until someone leaked them to the school newspaper five years later. Asked why the results weren't previously published, an administrator told the Daily Princetonian, “A story that Princeton’s rates of students who have been assaulted is on line with national averages is really not a story, but I mean in this news environment, people would make a big deal about it.”

This is exactly why we need to put every school on an equal footing, with a standardized, comparable measure of sexual violence rates. Based on survey data already available, most likely we wouldn’t see much variation in victimization rates from campus to campus, says Nancy Chi Cantalupo, a researcher with the Georgetown University Law Center who has advocated for climate surveys.

But a universal survey requirement would force schools to publicly acknowledge the extent of sexual violence on their campuses. Then they could stop worrying about embarrassment that might result from more accurate measurement of crime rates — and focus instead on better ways to prevent and respond to the crimes themselves.

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