



# Geological Sciences

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

## From the Department Chair...

Welcome to our 2014 newsletter! The past year has been very exciting for the Department of Geological Sciences, with continuing growth in the number of both faculty members and students.

The department continues to build on areas of strength with four new faculty members hired in the past two years—Bruno Basso (crop modeling, land use sustainability), Matt Schrenk (geomicrobiology), Masako Tominaga (marine geology and geophysics) and Jay Zarnetske (hydrology). All four are now on campus and are moving their research and teaching programs forward. We are also recruiting two endowed faculty in solid earth sciences; I will have more to report on these recruits next year. Our faculty members are the core strength of the department, and I am proud of the success that we have collectively achieved over the past several years.

We had some very sad news late last year with the loss of Dr. Aureal Cross. For all of you who knew Dr. Cross, you know the passion that he shared with students, faculty and friends through the years. He left an indelible mark on many of our alums and a much broader community of people who were lucky enough to know him as a friend and colleague (see feature article on page 3).

Field experiences are one thing that sets the geological sciences apart from most disciplines. These opportunities help our students synthesize the material they learn in classrooms and labs, and enhance their understanding about how natural systems change through time. Our students get field opportunities from Michigan to Park City, Utah, and many participate in a spring break trip each year to explore the geology of a region chosen by our geology club.

I have been working to expand their options to include a one- to four-week field experience in the French Alps, which would provide them with an opportunity to see a



Students from France and the United States listen to a lecture and draw structures associated with a major fault system during the Transect of the Alps field trip in May 2014.

very different tectonic setting that includes a range of geologic structures that they don't experience in their current courses (see photo). This would involve an emerging international exchange program that would allow our students to exchange to several programs, including geology, from a university located one hour north of Paris.

In May, I traveled to the Alps to evaluate the program and found that it would be an exceptional scientific and cultural opportunity for our students; we hope to get an agreement approved in the next year so that students can enroll. The department tries to offset a significant portion of the costs associated with field-related educational trips using alumni endowments, so I would like to thank everyone who has helped make this a possibility.

I always enjoy meeting with our alums, and hope to see you either here in East Lansing or at one of our upcoming alumni events. We already have two alumni receptions planned this fall near convention centers during the annual meetings of the Geological Sciences

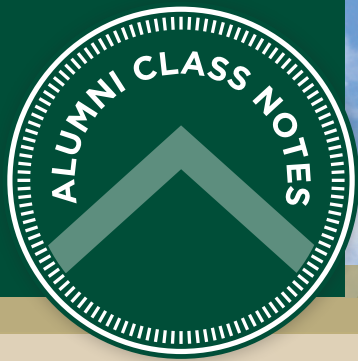
of America (the week of October 20 in Vancouver B.C, Canada) and the American Geophysical Union (the week of December 15 in San Francisco, Calif.). These will be held in a restaurant or pub near the respective convention center.

If you did not receive email invitations to similar events last year, please contact Elizabeth Wheeler, [szufnar@msu.edu](mailto:szufnar@msu.edu), to ensure that we have your current contact information.

I hope that you enjoy reading the newsletter and that you will keep in touch with us about what is new in your life. And thank you, as always, for your continued support of our programs and students.



David Hyndman, Ph.D.  
Chair,  
Department of Geological  
Sciences



**Michael Mottl**, geology, '70, will serve as chair of the Department of Oceanography at the University of Hawaii at Manoa for the next three years. He co-edited Vol. 8 of the *Treatise on Geochemistry*, "The Oceans and Marine Chemistry," which was published by Elsevier in late 2013.

**David Robbins**, geology, '73, is putting his somewhat dormant geology research skills back into practice in presenting this summer at the annual meeting of the American Scientific Affiliation in Hamilton, Ontario. His presentation is titled, "Noah and the Voice of Science: Toward a Robust Theory for a Bronze Age Global Flood." He is still working as a technical writer, and is currently working with a manufacturing software group at GE Intelligent Platforms in the Greater Detroit area.

**Joseph Pachut**, Ph.D., geology, '77, published two papers on bryozoan cladistics in the *Journal of Paleontology* in 2013.

**Matt Frankforter**, geology, '80, just finished a one-year term as acting president of the Alaska Geological Society. He also co-authored "The Granite Point Field, Cook Inlet, Alaska" in the recently published AAPG Memoir 104, *Oil and Gas Fields of the Cook Inlet Basin, Alaska*. He continues to work as a senior geologist for Hilcorp Alaska, LLC, developing the Trading Bay oil field.

**Richard Duschl**, M.A.T., geology, '82, has been appointed director, Division of Research on Learning in Formal and Informal Settings, for the National Science Foundation. He is on a rotation appointment from Pennsylvania State

University, where he is the Waterbury Chair Professor of Secondary Education.

**Jay Gregg**, Ph.D., geology, '82, stepped down as head of the Boone Pickens School of Geology at Oklahoma State University, and then spent most of 2013 (January - August) on sabbatical working on the Carbonate Research Team at Shell Global Solutions in Rijswijk, Netherlands. He returned to Oklahoma State University at the beginning of fall semester, and is currently working on publishing a study of dolomitization of Mississippian carbonates on the Isle of Man, and is working with his graduate students on Mississippian carbonates on the southern Mid-continent of North America.

**Liz Dobson**, geology, '84, is an environmental health and safety officer at Union College, Schenectady, N.Y., where she oversees chemical, radiation and laser safety, and laboratory safety. She interacts with the geology faculty at the college, so she still feels connected to her roots!

**S. Frank Rabbio**, geology, '85; M.S., geology, '88, has been named a partner with Pronghorn Operating Company in Denver, Colo. He is exploring for oil in the Las Animas Arch area of eastern Colorado.

**Nick Wigginton**, geological sciences, '03, was recently promoted to senior editor at *Science*.

**Chad Thompson**, geological sciences and environmental geosciences, '04, is employed with HSW Engineering, Inc., in Florida, as a staff scientist

II/geologist. He is a member of the Southeastern Geological Society (SEGS).

**Tori Holmes**, earth science, '08, just attained her master's degree in counseling and student affairs in higher education after working for the Housing and Residence Life Department at Western Kentucky University for three years. She has also taken a new job at the Michigan School of Professional Psychology in Farmington Hills, Mich., as their new coordinator of admissions and student engagement.

**Zachary Naylor**, environmental geosciences, '13, recently accepted a job as an associate radio frequency engineer with PCTEL, Melbourne, Fla. He travels a lot and loves his job, but hopes one day to find himself back in East Lansing, Mich.

## Contact Us

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Photographs and images courtesy of: Department of Geological Sciences, MSU Office of Communications and Brand Strategy, and Harley Seeley.

## Aureal Cross

The Michigan State University (MSU) College of Natural Science (CNS) is saddened by the loss of Aureal T. Cross, professor emeritus of geological sciences and botany. He died Dec. 2, 2013, at Sparrow Hospital in Lansing, Mich. He was 97 years old.

“Aureal was a remarkable individual who touched many lives through his incredible career,” said David Hyndman, chair of the Department of Geological Sciences.

Cross joined the MSU faculty in 1961, with joint appointments as professor in the Departments of Geology and Botany and was curator of the Fossil Plant Herbarium. At MSU, he established one of the most comprehensive graduate training programs in paleobotany, palynology, biostratigraphy and paleoecology in North America.

“He began his college career with no hint that his would be a long life devoted to understanding earth history as a paleobotanist, coal geologist and palynologist,” said Ralph Taggart, professor of geological sciences and one of Cross’s former students.

Cross’s undergraduate years began with a history and music scholarship to Coe College, a small Presbyterian institution in Cedar Rapids, Iowa. After taking L.R. Wilson’s physical geology course, “the direction of Aureal’s life was irrevocably changed,” Taggart stated.

Cross received his B.A. from Coe College (1939), and his M.A. in botany (1941) and his Ph.D. in botany and paleontology (1943) from the University of Cincinnati.

He taught premedical U.S. Navy students at the University of Notre Dame (1943-1946), was assistant professor of geology at the University of Cincinnati (1946-1949) and associate professor of geology at West Virginia University until 1957. Prior to coming to MSU, he spent four years setting up a palynological research group for the Pan American Petroleum Corporation (later Amoco, and now BP) Research Center in Tulsa, Oklahoma.



Aureal Cross and a small portion of his collection at Michigan State University.

After retiring from MSU in 1986, Cross continued working on research projects, attending professional meetings and publishing manuscripts. Most recently, he co-authored a paper with Taggart; it was published in February 2009 in *Global and Planetary Change*.

“I am convinced that he gathered more awards and medals for his research, teaching and professional service during his retirement than most faculty do during their most active years,” noted Taggart.

“With Aureal’s passing, we’ve lost a living link to one of the individuals who built the foundations of modern paleobiology in the early 20th century,” Taggart continued. “We’ve also lost an incredibly productive geologist, paleobotanist and teacher. He never expected anything less than 100 percent commitment, whether in his own work or that of the dozens of graduate students he mentored in his lab. He exemplified the highest standards for service to his profession, his university and his community. He was truly ‘a man for all seasons,’ and it seems hardly adequate to say that he will be missed.”

In 1999, at the 32nd Annual Meeting of the American Association of Stratigraphic Palynologists (AASP), Cross was named the first-ever recipient of the AASP Medal of Excellence in Education. During Cross’s emotional acceptance speech, he spoke of how he wished he could live to be 1,000 years old so that he could have the chance to do all the things remaining to be done in his field.

Cross’s influence will live on as others further the work he began. His research materials will be accessible to future palynologists for decades to come; the entire Cross Collection from MSU has been transferred to the Field Museum in Chicago. In addition, the Dr. Aureal T. Cross Endowed Graduate Fellowship, established at MSU in 2005, will continue to support graduate student recruitment and/or summer graduate research projects.

A memorial service for Cross was held on June 7, 2014. 📍

# Evaluating critical thinking as a gateway to STEM success

**I**t's fall 2012...

Julie Libarkin, associate professor of geological sciences, and Stephen Thomas, assistant professor of zoology, hypothesize that critical thinking skills are the gateway to success in STEM fields.

Matt Rowe, a professor of zoology slated to join MSU in 2013, has developed a course that ranked high in a national study looking at improvements in critical thinking.

Thomas presents the idea of morphing Rowe's course into an online setting, with its objectives centered on critical thinking and scientific literacy.

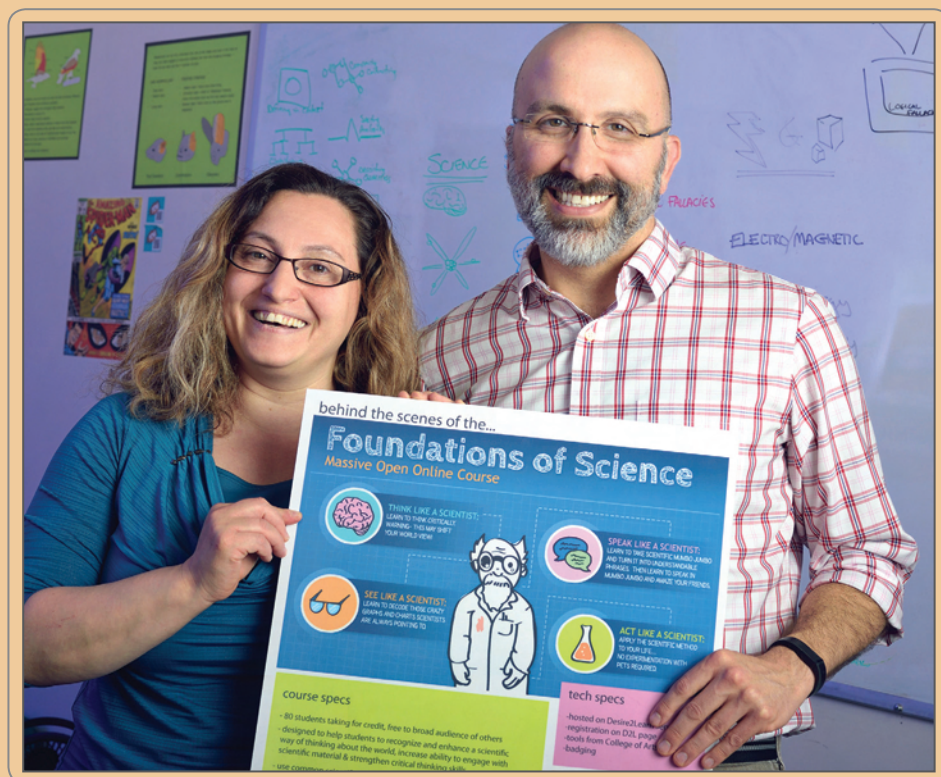
At the same time, The Gates Foundation puts out a call for proposals for the creation of MOOCs for foundational courses—courses that are known to sometimes inhibit underrepresented groups from being successful in college, or moving further along that path. Creating a MOOC for introductory courses at that time was unusual, Thomas pointed out; the MOOC landscape typically featured highly specialized courses, such as nanotechnology and thermodynamics.

The serendipitous merging of all of these events led to the May 2013 launch of MSU's first free Massive Open Online Course (MOOC)—The Foundations of Science—a course so successful that it recently won a 2014 MSU AT&T Faculty-Staff Instructional Technology Award for online instruction.

“There has been a growing interest institutionally in providing more students with increased opportunities for critical thinking, recognizing that it may be an important gateway,” Libarkin said. “If students can't get that gate open, they may be prohibited from certain kinds of majors, or even from completing college at all.”

While Thomas focused on the MOOC's curriculum development, Libarkin, who is affiliated with MSU's Cognitive Science Program, was primarily interested in curriculum assessment. Using a crowdsourcing site, she created an instrument for pre- and post-assessment.

“We measured many things, but the three



The Foundations of Science, MSU's first free Massive Open Online Course (MOOC), was launched in May 2013. While Stephen Thomas (right) focused on the course's curriculum development, Julie Libarkin (left) focused on curriculum assessment.

most important were: critical thinking, propensity to accept pseudoscientific statements and propensity to accept scientific statements,” Libarkin said.

“In a critical thinking course like this one, you want to see that critical thinking goes up, biases go down and the ability to recognize how to ask and answer questions goes up; you don't want students to blindly accept scientific statements,” Libarkin said.

“What we found was that after completing the course, the students' critical thinking did increase and their propensity to agree with pseudoscience went down. They came in with the view that “I'm not blindly accepting of science, but I don't not accept it”; and they left with that as well.”

Spring semester 2014, Libarkin decided to take some of the MOOC materials—the critical thinking subset—and embed them in a course she taught on climate change.

One of the students who completed Libarkin's course said, “I have recommended your online class to many people. I appreciated that you

taught us how to think about information. I've found that in my past science classes we were forced to just accept all of the information that was presented. Your class challenged us to think of things on our own and come to our own conclusions. I wish I had taken this class before my senior year.”

The plan now is to move this massively successful MOOC to a website format—not tied to a course or a specific time. There, individuals will be able to engage with the material on their own time and at their own pace.

“Our vision is it will be more museum-like,” Libarkin said. “For example, if someone walks into a museum, sees one exhibit, and leaves—the museum sees that as a success. You don't have to walk through the entire museum, see every exhibit, and take a final test. Our model is the same; you go in, you sample what you want to sample, and you leave.”

“The idea is that if you have this huge resource of free education, you want to make it accessible, and scaffold that experience for as many people as possible,” Thomas said. 🟢

## Burgess Shale fossils provide valuable information

**D**anita Brandt, associate professor of geological sciences, is a frequent visitor to the Smithsonian Institution in Washington, D.C., where she is studying Burgess Shale arthropods.

Located in the Canadian Rocky Mountains in British Columbia, The Burgess Shale is one of the world's most famous fossil fields. The Smithsonian houses the largest collection of these fossils in the United States.

Brandt's recent research has focused on studying the molting patterns of arthropods' exoskeletons.

"After working out the general pattern of molting among modern arthropods and hypothesizing that a systematic molting pattern might affect the evolutionary success of different arthropod groups, I wanted to see if I could extend these generalizations back to the earliest arthropod fauna—the Burgess Shale," Brandt said.

"The Burgess Shale is an important fossil fauna because there are so many previously unknown life forms. It provides a rare glimpse of a very small slice of time where there was exceptional preservation. The conditions were just right—rapid burial, anoxic environment—to preserve these creatures," Brandt said.

Her study focuses on a half dozen species of these extinct arthropods, including the vividly named *Waptia Marrella*, *Leanchoilia*, *Emeraldella*, and *Canadaspis*.

While looking through the Smithsonian's collections, Brandt noticed recurring patterns. The style of molting is a characteristic

that is consistent among related groups, she explained. "If we can see how they molt, we might be able to classify them."

When looking at a fossil, you can't always be sure whether you're looking at a carcass or a molt, Brandt further explained. If you're trying to determine biomass—how many total individuals there were—it's important to be able to tell the difference.



Danita Brandt, associate professor of geological sciences, examines a Burgess Shale fossil. Her recent research has focused on studying the molting patterns of arthropods' exoskeletons.

"With some of these," Brandt said, referring to the Burgess Shale fossils, "you can see a trace of the digestive system; that indicates it's a carcass.

"To be able to discern something about the biology of these earliest arthropods, which lived more than 500 million years ago, that's kind of cool!" 📌

## Alligators, hippos and palm trees ... in the Arctic? Oh, my!

**M**ichael Gottfried, MSU associate professor of geological sciences, co-authored a paper that appeared in the May 1 issue of *PLOS ONE*, an open access journal of the Public Library of Science.

"We have been looking at fossils from the Canadian Arctic from 50 million years ago, to help us interpret what we can about climate and environmental conditions," Gottfried explained. "During that time interval, the Earth was much, much warmer; warm temperate to subtropical conditions existed all the way toward the North and South Poles. And during that period, there were alligators, hippos, palm trees, turtles, warm water fishes and sharks in the Arctic—things you don't think of as living in a polar environment."

Gottfried's recent paper—co-authored with Jaelyn J. Eberle, associate professor of geological sciences at the University of Colorado Boulder, and two others—describes some of the fossil remains recovered from Banks Island, located on the western side of the Canadian Arctic. Earlier work was more focused on Ellesmere Island, on the far eastern end of Arctic Canada.

According to what's preserved in the record, the Ellesmere Island fossils represent a more terrestrial environment, supporting land plants and a variety of mammals, while the Banks Island discoveries just reported on in *PLOS ONE* are from a more coastal and marine-influenced setting.

"We now have an assemblage of warm water fishes, and an alligator bone, from

Banks Island," Gottfried said. "So we know these were present in the far western part of the Arctic at that time."

The Arctic Ocean during that period was not only much warmer; it was much closer to fresh water, Gottfried explained.

"We believe that salinity would have been very low, even in the open parts of the ocean. So the marine environment would have been quite a bit different from a more normal oceanic setting," he said.

"All of this information gives us an idea about how radically climates have changed over many millions of years," Gottfried said. "We're hoping this will inform us, to some degree, as to what kinds of environmental changes we should anticipate in the polar regions in the years to come." 📌

## Faculty Honors

Associate professor **Bruno Basso** was named a 2013 fellow of the American Society of Agronomy for his research on crop modeling systems and land use sustainability. He leads the soil initiative for the Agricultural Model Intercomparison and Improvement Project, a major international effort by the U.S. Department of Agriculture, which works to link climate, crop and economic modeling communities with cutting-edge technology to produce improved crop models.

Four members of the Department of Geological Sciences received 2013-14 awards from the College of Natural Science (NatSci) during its annual awards program last November: professor **Ralph E. Taggart** received the James D. Hoeschele Endowed Teaching Award; assistant professor **Remke L. Van Dam** received the Ronald W. Wilson Endowed Teaching Award; and professor **David T. Long** and specialist **M. Jane Rice** received NatSci Teaching Prizes.

## Mackey receives silver medal for work in Russia

**K**evin Mackey, MSU associate professor of geological sciences, was selected last September to receive a silver medal from the Sakha Academy of Sciences “for merits in development of the science for the Republic of Sakha (Yakutia)” for his long-term creative work in seismology and tectonics in northeast Russia.

“I have been working in Russia for nearly 20 years, and I am glad that my work has been helpful to the people and scientists of the Sakha Republic (Yakutia),” Mackey said.

David Hyndman, geological sciences department chair, said that Mackey’s long-term contributions have improved the understanding of plate movements and earthquakes in northeast Russia.

“This work is a model for successful international partnerships, which are important to the department and the College of Natural Science,” Hyndman added.

The Sakha Republic is a semi-autonomous republic within the Russian Federation. The Sakha Academy of Sciences, in conjunction with the Siberian Branch, Russian Academy of Sciences, oversees all science and cultural research in Yakutia, including geology, archaeology, linguistics and physics.



Kevin Mackey (right), geological sciences associate professor, received his silver medal from Sergey Shibaev, director, Yakutsk Affiliate, Geophysical Survey Siberian Branch, Russian Academy of Sciences, when Shibaev was visiting MSU last November.

## Karen Wayland: Combining a passion for science and policy

**K**aren Wayland (Ph.D., environmental geosciences/resource development, '01) has a passion for policy and science. Working in Washington, D.C., has provided the ultimate opportunity to combine the two. She is now a recognized expert in federal and state energy and environmental policy.



Karen Wayland

Upon completing her dual Ph.D. degree from MSU, she became a AAAS Congressional Science Fellow, sponsored by the American Geophysical Society. She worked on nuclear waste, energy, water resources and Native American issues. It was during this period that Wayland first began lecturing on the role of scientists in policy, which she has continued to this day.

Wayland was honored by MSU this spring for her many accomplishments. She received the 2014 Recent Alumni Award during the College of Natural Science Alumni Association annual awards ceremony held at MSU’s Kellogg Hotel and Conference Center on April 25.

Over the past 13 years, she has been involved in major policy debates—ranging from comprehensive climate legislation, vehicle fuel efficiency, and BP oil spill response, to Clean Water and Clean Air Act amendments, multiple energy bills and public lands conservation.

Wayland served as advisor to the Speaker of the House and the Majority Whip of the Senate. She worked at the Natural Resources Defense Council, where she lobbied Congress on environmental issues. She has taught at Georgetown University. Wayland has appeared as a commentator on national TV and radio programs; directed the Earth and Marine Sciences Program at Earthwatch, a nonprofit organization; and was climate policy director at The Nature Conservancy.

She joined the U.S. Department of Energy last August. She currently coordinates stakeholder input to the nation’s first integrated plan for energy infrastructure—the Quadrennial Energy Review—which will provide recommendations to modernize the nation’s transmission, storage and distribution infrastructure. ♣

# From dust bowl to drones: The next agricultural revolution

**M**SU geological sciences associate professor Bruno Basso is working on projects that could help feed the world's growing population — projected to reach 9 billion by mid-century — in the face of climate change.

Basso and a team of researchers developed a new crop tool to forecast crop, soil, water and nutrient conditions in current and future climates. The System Approach for Land-Use Sustainability (SALUS) model can evaluate crop rotations, planting dates, irrigation and fertilizer use, as well as project crop yields and their impact on the land.

“SALUS offers us a great framework to easily compare different land-management approaches and select the most efficient strategies to increase crop yield and reduce environmental impact,” said Basso, who is part of MSU’s Global Water Initiative.

SALUS has been employed in several other projects monitoring grain yield and water use in water-sensitive areas.



*Thanks to MSU research that uses unmanned aerial vehicles, known as drones, farmers can now get a bird's-eye view of their fields and better assess crop*

“We have to reduce the environmental impact of fertilizers caused by nitrate leaching and greenhouse gas emissions, and produce more crops per drop of water,” explained Basso, who was part of an international team of scientists that recently developed an all-encompassing modeling system that integrates multiple crop simulations with improved climate change models.

“Quantifying uncertainties is an important step to build confidence in future yield forecasts produced by crop models,” Basso said. “The goal is to help researchers understand how increased greenhouse gases in the atmosphere, along with temperature increases and precipitation changes, will affect wheat yield globally. The models can also guide scientists’ efforts to create policies to improve food security and feed more people.”

Last fall, Basso introduced MSU’s first unmanned aerial vehicle (UAV, commonly called a drone), equipped with advanced sensors and an ecosystem simulation

model, as part of his ongoing work with crop modeling systems. The drone is capable of high-resolution imagery and is designed to help farmers maximize yields by improving nitrogen and water management and reducing environmental impacts.

“I have the ambitious goal of wanting to enhance scientific knowledge for living in a better world, hopefully with less poverty and enough food for the planet,” Basso said. 🌱

## Scientific strategies aim to reduce water use in profitable agriculture area

**L**arge areas of the Ogallala Aquifer, one of the most important sources of water for agricultural crops in the United States, are at risk of drying up if the aquifer continues to be drained at its current rate.

The Ogallala, also known as the High Plains Aquifer (HPA), spans from Texas to South Dakota and provides water to grow \$35 billion in crops each year. However, since the 1950s, when high-volume pumping began, the HPA’s saturated volume has declined by roughly the volume of Lake Erie.

Alternatives that could halt and reverse the unsustainable use of water in the aquifer were proposed by geological sciences associate professor Bruno Basso and collaborators in research published in December 2013 in the journal *Earth's Future*.

“Agriculture could be sustainable across much of the HPA if new science-based management strategies are adopted,” said David Hyndman, geological sciences professor and a co-author of the paper. “Broader adoption of research technologies, such as crop modeling and precision agriculture, can help identify the best management practices to move this region toward sustainability.”

Precision agriculture strategies that combine GPS technologies, unmanned aerial vehicles and crop modeling allow farmers to identify areas that need more water and fertilizer.

In addition, federal crop insurance could be changed. Such insurance currently requires a crop to be managed as either fully irrigated or as dry land. Full irrigation

insurance mandates a certain amount of water application over the growing season, disallowing deficit irrigation approaches that could save significant amounts of water.

The researchers believe that policies should address the issue in terms of crop yield — producing more crops per drop of water. They also stress that policies solidly grounded in science are critical to ensure long-term sustainability and environmental integrity.

Geological sciences research associate Anthony Kendall, another paper co-author, said that upgrades in irrigation systems could also reduce water loss from 30 percent to almost zero.

“Careful water management can stop excess water from flooding fields and leaching valuable nutrients from the soil,” he added. 🌱



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## New discovery helps solve mystery source of African lava

**F**loods of molten lava may sound like the stuff of apocalyptic theorists, but history is littered with evidence of such past events where vast lava outpourings originating deep in the Earth accompany the breakup of continents.

New research by Michigan State University geoscientists shows that the source of some of these epic outpourings, however, may not be as deep as once thought. The results, published in the journal *Geology* earlier this year, show that some of these lavas originated near the surface rather than deep within the mantle.

When geoscientists want to learn more about massive lava flows—the kind that accompany continental rifting and continent break up—they conduct field studies of the African tectonic plate. The Great Rift Valley of East Africa provides a snapshot of how a continent can be torn apart. What scientists learn is applicable to continental breakup around the globe.

“For decades, there’s been a big debate as to where the lavas from this massive outpouring came from,” said Tyrone Rooney, MSU geoscientist. “Did they emit from deep within the Earth? Or was there some contribution from shallower sources? Our research shows that some lavas came from within the African tectonic plate itself.”

Although much of this lava is probably derived from deep sources, Rooney’s team found that some parts of the tectonic plate also have melted to form an unusual group of lavas in Ethiopia. The researchers showed that the rocks, artifacts from the ancient outpouring, had chemical signatures of materials found in the lithosphere and were distinctly different from most of the other rocks in Ethiopia.

In a surprise finding, the team’s lab experiments further revealed that the Ethiopian samples matched rocks collected from other distant regions. The lavas in Arabia, Jordan, Egypt and Sudan are similar, which means that some of the ingredients that supply the massive outpourings have a shallow source that is tapped as the continents split apart.

Indeed, the seeds of the lithosphere’s own destruction may be contained within it, Rooney said.



*To study continental rifting, MSU researchers traveled to the Great Rift Valley of East Africa.*

“We’re interested in this because these massive outpourings happen around the same time continents break apart, create new oceans and affect the planet and the environment on a global scale,” he said. “So knowing the source of the lava gives us insights into a process that we still know little about.”

Rooney’s research laid the groundwork for a National Science Foundation grant that will allow him to continue to unlock the secrets of tectonic forces and continental rifting. 🌍