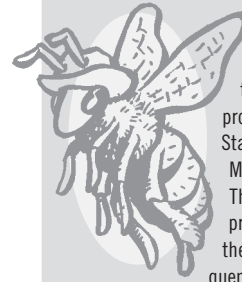


DISCOVERY

Newsletter of Research and Scholarship

Research Roundup

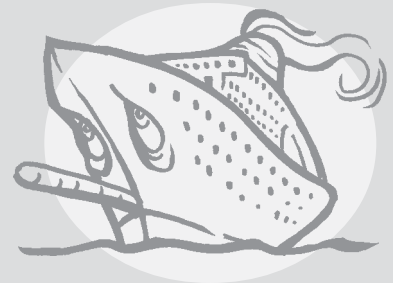


Sweet Montana

Montana is one of the top 10 honey producers in the United States, says Randy Rucker, MSU economics professor. The Dakotas are also big producers. After studying the causes and consequences of the federal honey program, Rucker said the program has had its ups and downs. Its effects were minor before the 1980s, but then treasury costs associated with the program skyrocketed to almost \$100 million a year for several years. Although changes were quickly made to reduce these costs, the honey program was eliminated in the 1996 Farm Bill. The program was re-instituted with the passage of the 2002 Farm Bill. Honey prices are currently at historical highs, largely due to restrictions on Chinese imports, Rucker said.

New to nursing homes

If you have an elderly relative moving into a nursing home, you may want to sit down right away with the staff to find out who does what. That advice comes from Cynthia Walton, a graduate student in the MSU College of Nursing. Walton studied the caregiving behaviors of 18 families in Missoula who placed elderly relatives in nursing homes. Most families stay involved in their relative's care but don't always know what their role should be: Does the staff take care of teeth brushing at night or should the spouse, for example. An orientation session can clear up those gray areas and make both family and staff more confident about the care they give, Walton said.



The sick boat

Instead of relaxation and romance, hundreds of passengers on recent Florida cruises have experienced vomiting and diarrhea. The intestinal illness is caused by the Norwalk virus, which readily spreads from person to person. The outbreak has kept MSU veterinary molecular biologist Michelle Hardy busy. She's an expert on Norwalk virus and has fielded a number of e-mails and phone calls in the last few weeks. One call was from a vice president of Holland America, whose Amsterdam cruise ship has had four Norwalk outbreaks. Hardy is working on a vaccine to prevent the illness as well as a medication for those who get it. Her partner is LigoCyte Pharmaceuticals of Bozeman.

Beginning teachers to receive e-mail mentoring



Bozeman teacher Chris Ottey works with sixth-grade students in a science lab at Sacajawea Middle School. MSU photo by Nikki Nason

by Evelyn Boswell

Chris Ottey has prepared hundreds of lesson plans, but he still remembers what it was like to be a new teacher and receive encouragement from a more experienced teacher. Judy Sander lived some 300 miles away, but they e-mailed each other several times a week, shrinking the distance between them and fostering the careers of both.

"I felt it helped me identify strategies and ways to solve different problems I was having in my classroom and share the successes, too, with someone in a common situation or common grade level," Ottey said recently from Sacajawea Middle School in Bozeman where he now teaches sixth grade math and science.

Sander, a fourth grade teacher in the East

Evergreen School District near Kalispell, said, "It's the idea of being able to talk about teaching itself, rather than talk about problems or kids. It's the actual teaching. 'How do you do this? How do you do that?'"

Sander and Ottey were paired for a year through a formal mentoring program that Montana State University-Bozeman started in 1993. That program will end in January, but MSU recently received \$3 million to help set up a new e-mail mentoring program for beginning science and math teachers. The five-year grant was part of a \$7.5-million grant the National Science Foundation gave the National Science Teachers Association (NSTA). The goal is to build skills and encourage new teachers to stay in the profession.

Mentoring continued on page 2

Veteran Antarctic researchers make another discovery

John Priscu has been to Antarctica more than a dozen times, but perhaps he never shivered more than in 1996 on Lake Vida.

"It was my coldest experience in Antarctica," the Montana State University ecology professor recalls. "We spent two weeks at -40 degrees Fahrenheit with little shelter and no heat. We had to eat fast or the food would freeze on the plate. The wind was so strong that it flattened our mountain tents."

Now that biting field season is breaking new scientific ground. The results of the studies appeared in the Dec. 16 issue of the prestigious *Proceedings of the National Academy of Sciences*.

Priscu, MSU civil engineering associate professor Ed Adams and former MSU postdoctoral student Chris Fritsen are three of the authors. The lead author is Peter Doran at the University of Illinois.

The scientists report a unique aquatic system where water seven times saltier than seawater is capped by 20 yards of ice that's nearly 3,000 years old.

What's more, they found freeze-dried microbes throughout the ice column that were revived in the presence of liquid water. Priscu calls these deeply frozen lakes "ice museums" because they harbor ancient DNA that is well preserved by the cold, salty and arid conditions.

"The ice covers of these lakes represent an oasis for life in an environment previously thought to be inhospitable," Priscu said. "These organisms may possess novel ice-active substances such as antifreezes and ice nucleation inhibitors that allow them to survive the freeze-thaw cycles and come back to life when exposed to liquid water."



Bottom: The camp at Lake Vida. The wind was so strong during the 1996 field season that it flattened the mountain tents. J. Priscu photo.

Top: Scientists saw an observation hole in the permanent lake ice of a dry valley lake in Antarctica. J. Priscu photo.

Lake Vida, more than three miles long, is one of the largest in the cold Antarctic desert region known as the McMurdo Dry Valleys in the Transantarctic Mountains. The area receives less than four inches of snow per year and the average annual temperature hovers around -22° F.

Scientists previously thought Lake Vida, like several Antarctic lakes, was frozen to its bed year-round. However, using ground-penetrating radar, ice core analysis and long-term temperature data, the researchers now show that

Vida has a thick ice cover, a vast amount of ancient microbial biomass, and a cold, super-salty, liquid pool underlying the ice that remains liquid at temperatures below 14° F.

The researchers think Lake Vida offers clues for how to look for simple life forms in outer space.

"Mars is believed to have a water-rich past, and if life developed, a Lake Vida-type ecosystem may have been the final niche for life on Mars before the water bodies froze solid," Doran said.

Priscu first went to Antarctica in 1984 as a specialist on freshwater lakes. Since then, he has become an expert on microbial life in the extreme Antarctic environment and the author or co-author of several key scientific papers. His most recent writings focus on the need to think about the earth's biosphere, or life zones, as encompassing icy systems such as sea ice, glacial ice

and permafrost.

"The Lake Vida results are only a small part of a much larger and more globally important, multifaceted story," Priscu said. "The earth's biosphere is larger than we had ever imagined, and the microbial world has few limits on our planet and, possibly, others."

The Lake Vida studies were funded by the National Science Foundation.

Mentoring continued from page 1

"Research shows that student test scores are highest when a teacher has at least seven years of classroom experience," said Elisabeth Swanson, director of the Science Math Resource Center at MSU and head of the mentoring project. "If we are successful, our second- through fourth-year teachers – their students will look more like the students of those more veteran teachers."

It used to be common for teachers to stay in the field for 20 to 30 years, but not any more, Swanson added. Studies have shown that 40 percent of the beginning teachers nationwide leave the profession

in the first five years.

"We need to help them be as effective as possible during their teaching career – whether it be three years or 20 years," Swanson said.

"E-Mentoring for Student Success" will match 50 beginning teachers a year with approximately the same number of mentors. All the teachers will be science and math teachers in middle schools and high schools. The beginning teachers will mainly work at rural or reservation schools in Montana, but also in Great Falls, Billings and Missoula. The mentors may teach in urban or rural schools.

"We're really excited they got that grant," said Erik Burke, director of public policy for the Montana

Education Association-Montana Federation of Teachers.

Burke tried unsuccessfully to persuade the last two Montana Legislatures to pass a teacher mentoring bill. Mentoring is significant, he said, because it can help rural areas retain teachers. It can also help teachers build their careers.

Partners in the project are the NSTA, the Burns Telecommunications Center at MSU, the NSF Center for Learning and Teaching in the West, and the New Teacher Center at the University of California, Santa Cruz.

Evelyn Boswell is the technical writer for the Office of Research, Creativity and Technology Transfer.

The Buzz about .biz

by Jan Zauha

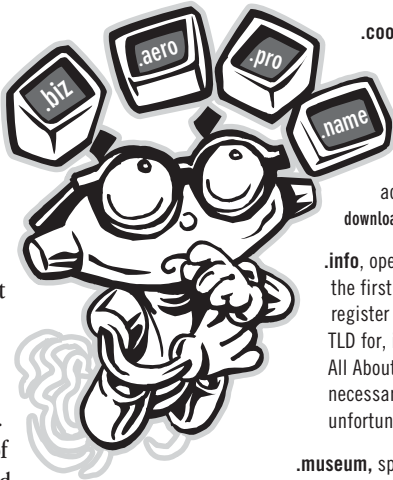
Sorting through the Web pile to identify reliable information often requires savvy interpretation of URLs. In your haste to reach real content online, however, you may not have noticed some changes in these addresses recently. Buried in the strings of dots, letters, slashes and dashes are some new top-level domain (TLD) suffixes that join the standards .gov, .edu, .mil, .com, .net, .org, and .int. Newly minted are .aero, .biz, .coop, .info, .name, .museum, and .pro suffixes.

Why care about TLD developments? For one thing, you may want to hurry and purchase your own name as a .name domain before an imposter does so. More reasonably, knowing the significance of a domain name suffix can help you understand and evaluate the information you find. Unfortunately, the most common TLD on the Web, .com, has become nearly meaningless in its ubiquity. While the seven new suffixes can't promise to clear all waters, they do offer more opportunity to identify point of origin.

The new TLDs were approved by the Internet Corporation for Assigned Names and Numbers (ICANN) [www.icann.org] in fall of 2000, with URL appearances beginning in 2001 and 2002. The new suffixes serve a mix of needs and intentions. Some are "sponsored" and are intended for use by a narrower, more controlled segment of the Internet community; some are "unsponsored" (.biz, .info, .name, .pro) and are less narrowly defined but still operate under policies established by the global Internet community directly through the ICANN process:

.aero, sponsored by SITA, the Societe Internationale de Telecommunications Aeronautiques [www.nic.aero], an airline telecommunications company based in Belgium, is intended for the exclusive use of the aviation community.

.biz, operated by NeuLevel [www.neulevel.biz], is "the first truly global Internet environment dedicated exclusively to businesses" [www.neulevel.biz/press/press_kit/fact_sheet.pdf].



.coop, sponsored by DotCooperation, LLC [www.coop], is intended for use only by cooperatives, cooperative service organizations and wholly owned subsidiaries of cooperatives. Individuals may not purchase a .coop name, according to the .coop Overview [www.nic.coop/downloads/Overview.pdf].

.info, operated by Afilias, LLC [www.nic.info/gateway], is the first unrestricted TLD since .com. Anyone can register .info domain names. This is the perfect Web TLD for, it seems, everyone and anyone, according to All About .Info [www.nic.info/about_info]. It doesn't necessarily signify an information-rich Web site, unfortunately.

.museum, sponsored by the Museum Domain Management Association (MuseDoma) [musedoma.museum], is restricted to museums, museum organizations and individual members of the museum profession.

.name, operated by Global Name Registry, LTD [www.nic.name/index_ns4.php], is unrestricted and has a stated intention that represents the unique nature of the individual in a Webbed world: "Names are an essential part of our lives. Now, with .name, your name can be central to your life online too. As your .name can be registered for up to 10 years and ownership is renewable, your .name really can be yours for life."

.pro, operated by RegistryPro, LTD [www.registrypro.com], is intended to become "the first-ever exclusive professional domain extension on the Internet." Doctors, lawyers, accountants, and other certified professionals may purchase domain names using .pro.

How prevalent are these new TLD suffixes on the Web right now? Do an advanced search for a common subject on an engine such as Google [www.google.com] and add a limit of one of the above extensions. You'll see that your search returns are much smaller with the new TLDs than the old. It may disappoint you, for instance, that there appear to be no .pro sites associated yet with "dogs." But visit the Global Name Registry, LTD [www.nic.name] and you may be heartened to find that your name.name is still available for as low as \$99.50 a decade.

To find out what else is new in the world of the Web, or for help finding other information, call or stop in at the fabulous new Renne Library reference desk. If you find Web sites or topics that you think might be of interest to the MSU community, please send me an e-mail message at jzauha@montana.edu.

Jan Zauha is the reference team leader for the MSU Libraries.

Technology transfer takes on a new look

by Becky Mahurin

Technology transfer at Montana State University took on a different look as of October 1, 2002. All technology transfer functions have been brought back into the university, following 22 years of utilizing an outside foundation to patent and license technologies.

The Intellectual Property and Technology Transfer Office (IPATNT) has been renamed the Technology Transfer Office (TTO). In my position as director of this office, I will now be handling a technology from the time it is disclosed, through patenting, until licensing occurs. It is the intent to make the operation more cost effective and efficient through this new "cradle-to-grave" approach to technology transfer.

Nick Zelter at MSU TechLink will be coordinating efforts on assessing and marketing technologies. Nick will rely on the professionals at TechLink who already assess and market federal technologies to work more closely on MSU technologies. We are able to draw on many areas of expertise and years of technology marketing experience at TechLink. We believe this will result in more licenses and broader utilization of our technologies.

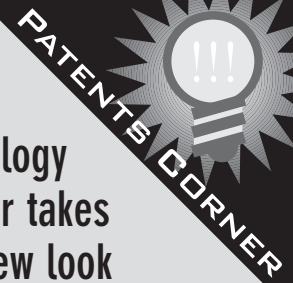
I now have offices in both Montana Hall and at the Advanced Technology Park to better accommodate both the faculty and private business people. Additionally, Denlyn Atherton has joined the TTO as Licensing Associate and is located at the Tech Park. Denlyn is currently working to complete her training as a paralegal and has already completed some "basic training" in technology transfer.

The main phone number for the TTO is 994-7868. I can still be reached at 994-2752. Denlyn and I look forward to working with many of you on new invention disclosures and licensing issues.

Becky Mahurin directs the MSU Technology Transfer Office.

Discovery is published monthly during the academic year by the MSU Office of the Vice President for Research, Creativity and Technology Transfer, 207 Montana Hall. Annette Trinity-Stevens, editor.

For more information, call 994-5607 or visit www.montana.edu/wwwvr.



Yellowstone plant reveals secret for tolerating high temperatures

by Annette Trinity-Stevens

A grass in Yellowstone National Park can withstand soil temperatures up to 140 degrees Fahrenheit if it gets a little help from a friend.

Hot springs panic grass, common in geyser basins throughout Yellowstone, would die in that environment if not for a stringy, microscopic fungus on the roots that helps the plant cope, a group of scientists in Montana and Washington has found.

The group published its findings in a recent issue of the prestigious journal *Science*.

"Even desert plants cool off at night," said Montana State University-Bozeman plant scientist and study co-author Rich Stout. "These plants don't. That's what makes them bizarre and interesting."

Plant-fungal partnerships may date back 500 million years or more to when plants first began to evolve. Fungi on the roots help plants absorb water and nutrients. For their efforts, the fungi get a place to live and access to food and water. The relationship is called mutualism.

But what's unique in this situation is the fungi don't just help gather food and water; they make the plant roots tough enough to tolerate the extreme soil temperatures typical in geyser basins. In fact, neither the plant nor the fungi



could live in hot Yellowstone soils alone, a relationship scientists refer to as symbiosis.

"We would have been surprised if the grass didn't have a fungal partner," said study co-author and MSU microbiologist Kathy Sheehan. "What surprised us is that it imparts thermotolerance to the plant."

Added Stout: "As far as we know, this is the first report of heat tolerance conferred by fungal involvement."

Just how the fungus, called *Curvularia*, makes hot springs panic grass thrive in soil temperatures that would kill most other plants isn't known. The fungus could help dissipate heat throughout the plant or it could act as a biological trigger that tells the plant to activate a stress response.

To find out, the scientists plan to analyze the

plant and fungal genetic codes. First they'll see which genes are switched on when the plant and fungi live alone. They'll compare those to the genes switched on when the plant and fungus do their "handshake" as soil temperatures start to climb.

Whatever the mechanism, the steamy partnership is an exciting one, according to soil microbiologist and MSU Thermal Biology Institute scientist Tim McDermott. TBI helped fund the studies through an

appropriation from Sen. Conrad Burns.

McDermott said there's interest in transferring this type of plant-fungal partnership to farm fields so that wheat or other crop plants could withstand higher soil temperatures during hot, dry summers.

"There's justifiable excitement about these kinds of applications," McDermott said.

The study's other co-authors are MSU microbiologist Joan Henson, and Regina Redman and Russell Rodriguez both from the University of Washington and the U.S. Geological Survey.

Annette Trinity-Stevens directs research communications at MSU-Bozeman.

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