The 2005 Research and Creative Activities Report is once again a time to celebrate the achievements of the great faculty and students at Montana State University.

Given the size of our institution, everyone should be proud of the fact that our expenditures from sponsored research programs almost eclipsed the $100 million milestone. While this is an impressive testimonial to the quality of our faculty and students, the goal is not to increase expenditures for the sake of an increase. Rather, our goal is to show what increased research funding means for the educational quality at MSU.

Our expenditures from sponsored research programs almost eclipsed the $100 million milestone.

Research at MSU means:
* We have faculty skilled enough to compete with others across the nation for projects funded by the federal government, many of them directed toward issues of national importance. Those issues include energy development, the production of food and fiber, and the education of the next generation.

We have non-state funds with which to purchase state-of-the-art laboratory and classroom equipment that ensures our students can compete in the job market. These funds offer our students experience with equipment they would not have access to at a non-research university.

We have students who can work with faculty on projects that make a difference in the lives of the students and the lives of others. These projects provide inquiry-based learning experiences that enable our students to enter the modern-day problem-solving workplace ready to perform.

We produce discoveries capable of being transferred to existing Montana companies or of starting up new companies. These technologies can form the basis for commercialization and economic development.

As part of the discovery of knowledge and pursuit of creative activities, our faculty are able to disseminate that knowledge in an environment that recognizes the complete integration of learning and discovery, teaching and research.

While recognizing that dollars expended are not the yardstick of success, it is worth noting that in 2005 the Department of Veterinary Molecular Biology became the first department on campus to surpass the $10 million milestone in sponsored research, having doubled its research volume in just two years. Importantly, the faculty's focus on infectious diseases, especially emergent zoonotic diseases that can move between livestock, wildlife and humans and the critical impact these disease may have on human health, ensures the scholarly activities of this department will continue to flourish.

I invite you to read through this report for information on climate change as measured in Yellowstone National Park (page 2). Other stories report on students studying at the ends of the Earth (page 20) and on the value of studying modern animals to better understand dinosaurs (page 16).

One writer went to northeastern Montana to report on West Nile virus (page 23). Another explored malt barley development and the prognosis for dryland cultivation of the crop in Montana. Stories on a professor at the forefront of fraud detection and one studying medicine and the humanities are also inside.

Developing wireless technology to address communications needs in Montana is described on page 5. Stories on teaching architecture students the solid side of their art (page 12) and helping Montana manufacturers thrive (page 10) round out this report.

I welcome any comments you may have.
Cathy Whitlock studies climate change one centimeter at a time. The MSU paleoecologist and her students examine the past 20,000 years of the West’s environmental history since the last ice age.

They scrutinize sediments in core samples taken from the bottom of lakes.

One centimeter of lake mud equals about 10 years, Whitlock said of her study sites in Yellowstone National Park.

“In these cores, we are looking at pollen grains, charcoal particles and maybe a few insect legs and wings that landed in the lake and sank to the bottom each year,” said Whitlock, who joined MSU’s Department of Earth Sciences last year after 14 years at the University of Oregon.

“Over time, the accumulation of these materials becomes a record of how forests have developed and changed, when fires and insect outbreaks have occurred, and how the ecosystem has responded to climate changes.”

Like paleoecologists around the globe, Whitlock reconstructs the past to understand the present and the future. Findings show that Yellowstone has experienced dramatic changes in its environment in the past, and it is still changing. Projected future climate conditions because of increased greenhouse gases exceed anything the park has seen in the last 1,000 years. Whitlock said that researchers have to go back at least 6,000 years to see comparable conditions like those projected in the coming century, and even those ancient examples aren’t perfect analogues.

“One difference is that current and future climate changes are occurring at a much faster rate than in the past, and we are unclear whether ecosystems can keep pace with changes of such magnitude,” she said.

Her Crevice Lake study site, a four-mile hike from the Grand Loop Road between Mammoth and Tower Junction in Yellowstone’s Northern Range, offers a unique glimpse of the past 12,000 years. Since the spring-fed lake is round and somewhat protected from
wind, the lake sediments are not stirred, receive no oxygen and host no organisms at its 100-foot depth.

Whitlock discovered the laminated sediments in Crevice Lake in 1992 and collected cores in 2001. The lighter brown summer layers and darker winter layers, she says, delineate the years as clearly as tree rings detail the annual growth of trees. And like tree-ring records, the laminations at Crevice Lake preserve a record of yearly ecological changes related to variations in temperature and moisture.

“With a core of sediments, you can see how the climate evolved, and you can see if the climate was warmer or cooler, or if there were droughts or floods,” said Christy Brile, a doctoral candidate from the University of Oregon’s geology program who works in Whitlock’s paleoecology lab. “But today, we have solar radiation and different variables that contribute to global warming. The studies do give us an idea of how resilient plant communities are to change.”

Whitlock noted that the ecosystem is continually changing.

“We are also finding that large fires, similar to those of 1988, affected many sites about 200 and 300 years ago, but fire frequency has been steadily decreasing over the last several millennia,” Whitlock said. “In the middle of a period, like that from 1,000 to 7,000 years ago, many watersheds experienced fires every few decades. The fire activity in Yellowstone is and has been closely tied to summer drought; when droughts were more severe, fires were more frequent. The long-time perspective teaches us that present-day conditions are short-lived and shouldn’t be viewed as normal.”

A very visible example of climate change, Whitlock said, is the dry and cracking lakebed among the ponds at Blacktail Lake

Current and future climate changes are occurring at a much faster rate than in the past, and we are unclear whether ecosystems can keep pace with changes of such magnitude.

of Yellowstone, another Northern Range study site. Like other lakes in the park, this lake shrank considerably in the last decade as a result of drought. Now its parched bone bed is of great interest to the paleoecologist because shifts in water level are another measure of climate change that can be detected in sediment cores.

“Whitlock’s research has implications for other research around Yellowstone,” said Roy Renkin, Yellowstone biologist. “She indicated that she is finding pine beetle insect fragments in sediment cores which shows a history that supersedes human presence in the park.”

Renkin notes that tree-boring bugs have infected 50,000 acres of Yellowstone forests. The four species of bark beetles and one budworm created seas of red,
We need to understand the ecosystem’s response to climate change to discover what will likely happen in the future.

The dried lakebed of a former pond among Yellowstone’s Blacktail Lakes portends climate change.

dead trees in what may be the largest insect outbreak recorded in Yellowstone.

“Through Whitlock’s research, we hope to identify periods of high levels of insect activity and find out if the outbreaks occur three times a century or six to seven times,” Renkin said. “We know of mountain pine beetle outbreaks in the 1930s and late 1960s and 70s in the same areas. We have a 100-year record. Whitlock’s research goes back centuries.”

Whitlock’s research is funded by the USGS, the National Science Foundation and the National Park Service. In addition to her work in the western U.S., she is also studying fire and climate history from similar settings in Argentina and Chile. Researchers travel to MSU from all over the world to receive training in the charcoal analysis methods that she helped develop.

Aside from her research, Whitlock teaches an “inquiry” course for non-science majors as part of MSU’s Core 2.0 curriculum for undergraduates. The class, Yellowstone: A Scientific Laboratory, takes 30 students to the park for field studies then back to campus for classroom discussions and lab work.

“We need to understand the ecosystem’s response to climate change to discover what will likely happen in the future,” Whitlock said.
When the grooming machines roll out of the garage at Montana's Bridger Bowl Ski Area, radio communication between the groomers and headquarters will no longer break off among the dips and gullies of the 2,000-acre resort, thanks to efforts by engineering students at Montana State University.

"Bridger Bowl was selected because it's the worst possible place (for wireless systems), and we showed it could be done," said Marshall Overcast, a senior in computer engineering from Sunburst, Mont.

The idea for the wireless communications originated from a Bozeman company, Midtech, Inc., whose specialty is global positioning systems for precision farming—computerized models of a farm that enable precise positioning for tractors. Farmers can monitor fields for complete plow coverage, for example, thereby avoiding double plowing or double planting an area.

"We have a preliminary version in place now at Bridger Bowl," says Richard Wolff, electrical and computer engineering professor. "We tested the global positioning system over the summer with all the varying terrain at Bridger Bowl. It is successful."

Wolff noted that in addition to collecting data on groomed slopes, ski area managers can design more efficient grooming paths. With the GPS unit in place, cat drivers know exactly where they are on a slope, even in whiteout conditions. The additional wireless network allows the ski area managers to continuously monitor the snow grooming operations for a real-time picture of where each cat is located and what areas of the slopes are groomed.

While wireless communication has many applications locally and globally, MSU researchers and students scoured the technology to discover new uses, Wolff said. He and his students have several wireless projects from wireless mobile robots used to teach undergraduates practical application of electrical engineering, to wireless gaming to be built into airplane cabins.

Inside the electrical circuits lab, students in Introduction to Electrical Fundamentals learn about their chosen major by assembling six-inch-tall robots.

"The robots are what make the class for me," said sophomore Kurt Wood of Ronan. "At first I had to learn to solder the parts. Once I got that down, I learned how the circuits worked. It's the best part of my classes. Creating the robots makes the math and the lectures all come together for practical experience."

Rob Maher, professor of electrical engineering, helped integrate the robots into the introductory course funded by a Montana Space Grant Consortium Educational Enhancement grant. He realized that eager new students interested in electrical engineering and computer engineer-
ing quickly discovered that the first year of college was filled with required courses and almost no engineering courses.

"Teaching freshman is particularly interesting and challenging because it can be hard for a professor to remember what it was like to learn the basic concepts for the first time," Maher said. "After seeing the robot—and the reaction of students who saw the prototype—I was convinced that this was an idea worth building upon."

Wireless is a huge growth opportunity for business, for home use and for MSU's students to understand and create new technology.

"The robots make class fun," said Gabriel Guillen, a sophomore from Dillon. "It's a great introduction for the course, great hands-on experience, and the robots get kids motivated to keep going. During our senior year, we will get to program the robot to do different things."

The "different things" are all part of Wolff's plan. As the Gilhousen Telecommunications Chair at MSU, Wolff focuses student projects and research on opportunities to use wireless and to address communication needs unique to Montana and sparsely populated regions.

Karen and Klein Gilhousen gave $5 million to the College of Engineering to establish the chair in 2001 and to provide Gilhousen Scholarships for the electrical and computer engineering department. Gilhousen is the cofounder and vice president of Qualcomm, Inc., a Fortune 500 company.

"Much of the wireless research and technology development is focused on a different set of problems, typically urban and metro areas, and the solutions do not necessarily apply in Montana," Wolff said. "In fact, areas like Montana are often overlooked, thus the late arrival of cell phone services and low penetration of high-speed Internet access. There is a vacuum, which translates into opportunities for research, education, technology development and business."

With this in mind, Wolff concentrates efforts to identify the gaps and establish educational, research and industry relationships at MSU to fill the voids. Additional projects include an NSF-funded exploration of ways to provide traveler information services in rural and remote areas; industry funding from Advanced Acoustic Concepts to exploit emerging wireless technologies for high-speed, long range sensor networks; and National Science Foundation funding for wireless communication networks for rural areas.

"My approach has been to maximize engagement of university colleagues, students and local industry," Wolff said.

He developed new courses in wireless systems for the College of Engineering's curriculum, sponsored and supervised a variety of electrical engineering senior design projects exploiting wireless technologies, created collaborations with faculty in several departments and forged strong working relationships with local industry partners.

"The future of wireless technology is that it will continue to grow," Wolff said. "A billion and a half people, one-quarter of the world's population, use cell phones, for example. Wireless is a huge growth opportunity for business, for home use and for MSU's students to understand the technology and create new technology."
In the black and white world of accounting, Montana State University professor Bonita Peterson Kramer teaches students how to find crime in areas of gray.

Kramer, a professor of accounting in MSU's College of Business, is one of the country's few academics to study, write and teach about how to detect fraud.

Her research deals with fraud's manifestations in such things as phantom vendors, "cooked" sets of books and ghost employees. As a result of Kramer's work, MSU is one of a small number of institutions that teach about fraud detection.

"Fraud examination caters to the secret detective in all of us and students love it," Kramer said, adding that fraud investigating is accounting's version of a CSI, or crime scene investigator. That may be because, "by its very nature, fraud is hidden," says Joseph Wells, a pioneer in contemporary fraud detection whom Kramer helped bring to campus to lecture in 2002.

While fraud is concealed, it seems to be everywhere. Several large-scale corporate fraud cases, including Enron, Tyco and WorldCom, have vaulted the issue to international prominence.

Kramer points out that fraud doesn't just occur with large companies. In fact, one of her first published instructional fraud cases was inspired by an incident at MSU in which the manager of a department secretly sold off university computers for personal gain. Another of Kramer's published case studies was inspired by an incident in a neighboring state in which a disgruntled employee of a food supply company invented fictitious vendors to defraud his employer of millions of dollars.

Kramer said fraud specialists believe that such incidents occur more frequently than is known. The accounting firm KPMG reported in 2003 that 75 percent of organizations experienced some type of fraud in the previous year. She noted
10 TRUTHS EVERYONE SHOULD KNOW ABOUT FRAUD

How much do you know about fraud? Here are 10 truths about the crime that MSU accounting professor Bonita Peterson Kramer says will help reduce the risks of fraud occurring in a business. Written with Paul E. Zikmund, director of forensic audit with Tyco International, Inc., the tips were published in the May 2004 edition of "Strategic Finance."

1. FRAUD IS PREVALENT.
Fraud knows no boundaries regardless of the industry, country or size of the company. The Association of Certified Fraud Examiners estimated that there were $650 billion of fraud losses in the U.S. in 2002, or 6 percent of revenues. In general, the ACFE reported, smaller companies suffer proportionally larger losses. "No organization is immune," Kramer said.

2. ANYONE CAN COMMIT FRAUD.
Fraud perpetrators are likely to be married, educated beyond high school, have an employment record of one to more than 20 years, range in age from teens to their 60s, have no previous record of crime and belong to a church. In other words, their profile fits that of most honest people.

3. WHY PEOPLE COMMIT FRAUD.
Kramer says three elements must be present for someone to commit fraud. There must be a motive. There must be a perceived opportunity to commit the fraud and get away with it and there must be a rationalization, or an excuse to justify why the perpetrator’s actions aren’t a crime to him or her. Kramer says these three reasons are known as the "fraud triangle."

4. THE BEST DETERRENT IS TO INCREASE THE PERCEPTION OF DETECTION.
Employees are much less likely to commit fraud if they believe they will be caught, Kramer said. She advises a strong system of controls. She also said the company should let its employees know about its efforts to combat fraud, such as establishing an anonymous hotline for reporting fraud.

5. PERPETRATORS ARE OFTEN TRUSTED EMPLOYEES.
To be able to commit fraud, the perpetrator must have been in a position of trust, Kramer points out. "Trust is not an internal control," she said.

Great Falls native Bonita Kramer, shown here with her family, is one of the country’s few academics to study, write and teach about how to detect fraud.

the number is probably larger because many victimized companies are too embarrassed to report it and many frauds are undetected.

Kramer came to her specialty through the sister field of auditing. A Great Falls native. Kramer joined the Legislative Auditor’s Office in Helena after graduation from MSU’s accounting program in 1983. She later worked at KPMG Peat Marwick in Midland, Texas. While auditors are not fraud specialists, fraud detection “spilled over” into her work and she found that she liked its forensic qualities.

While earning advanced degrees in accounting from the University of Montana (master’s) and Washington State University (Ph.D.), Kramer found she also loved teaching. Since returning to her alma mater in 1994, Kramer has become an award-winning professor, winning the MSU Cox Excellence Award for scholarship and instruction as well as the Montana Society of CPAs’ Outstanding Educator Award. Kramer’s teaching ability is evident in her annual preparation of MSU students for the auditing section of the Certified Public Accountant exam. MSU students traditionally score among the top in the country on that rigorous exam.

As her teaching career flourishes at MSU, so has her cultivation of scholar-
ship in the relatively new field of academic fraud research. Her work in the field began with her collaboration with MSU treasurer Tom Gibson on a case-based article that was published in 1999 in the academic journal “Issues in Accounting Education.”

After that, Kramer attended national meetings and conferences on the subject where she met and began to work with some of the leaders in what she says is a small scholastic field. She has published or co-published articles on fraud in several national and international journals and has published several fraud case studies that are used in accounting classrooms at universities around the country. Two of her articles have won national awards from accounting practitioner journals including, “10 Truths You Need to Know About Fraud.”

Kramer’s most recent article on the issue, co-written with MSU finance professor Greg Durham, has been accepted for publication by the “Journal of the Academy of Business Education.” Kramer said it is important to reach to general business journals because, “Fraud is a business problem, not just an accounting problem.”

Kramer has also developed an MSU course on fraud detection. Some 21 graduate students enrolled in the course when she first introduced it in 2003, making it the most popular graduate elective in accounting that year. She continues to teach the course in the summer.

Kramer said that several of her students have become so intrigued with fraud examination that they are pursuing careers in the area. For the majority of her students, however, fraud education will be an important tool in their future practice.

“I hope that as a result of my classes they are better prepared to recognize fraud if they run into it,” she said. “It’s something that I love to teach. It amazes me how prevalent it is and how such otherwise ordinary people can commit this crime.”

6. FRAUD SCHEMES ARE NOT UNLIMITED IN NUMBER.
Kramer said that asset misappropriation, or employee fraud, is the most common category of fraud.

7. RED FLAGS ARE ONLY WARNINGS.
Red flags don’t mean fraud has occurred, but if observed, employers should discreetly begin an investigation into whether the company has internal control weaknesses that are being exploited. Red flags for employee fraud include personal financial pressures, abuses of drugs or alcohol, and extravagant purchases or lifestyle.

8. AUDITORS CAN’T BE RELIED UPON TO DETECT FRAUD.
Kramer says that the auditing profession does not place a heavy burden on auditors to detect fraud. Auditors have no responsibility to detect small frauds and are responsible only for providing reasonable assurance—not a guarantee—of detecting any large frauds. She said companies who believe a good audit report means fraud does not exist in his or her organizations could be mistaken.

9. HOTLINES AND FRAUD ASSESSMENT QUESTIONING ARE USEFUL TECHNIQUES.
Because tips are a frequent means of discovering fraud, they should be encouraged through hotlines and an interviewing technique called fraud assessment questioning. “Most employees are willing to reveal fraud if they are asked the right questions,” Kramer said. More information on FAQs can be found at www.nyscpa.org/cpajournal/2001/0400/features/104301.htm.

10. PREVENTION IS SUPERIOR TO DETECTION.
Kramer said the cost of fraud is staggering and can mean death to a small business. She advises that all organizations institute strong controls to reduce the opportunity for fraud and proactive measures to detect it.
Being lean is a concern for more than just weight-conscious Americans. Manufacturers, too, like to be lean, which is best described as eliminating waste in day-to-day operations and being customer driven.

Montana companies in communities as large as Billings and as small as Opheim are applying lean manufacturing concepts with help from the Montana Manufacturing Extension Center, a national leader among manufacturing assistance programs. MMEC is a statewide outreach center in the MSU College of Engineering.

Overall, the center provides direct, unbiased engineering and managerial assistance, often as a partner with other public and private resources. It has completed more than 1,000 projects since the program began in 1996. The center operates from six offices in the state--two in Bozeman and one each in Missoula, Kalispell, Billings and Helena. More than 500 manufacturers in 47 of the state's 56 counties have worked with the center.

Much of the center's help focuses on lean manufacturing best illustrated by the methods that Toyota uses.

Jim Markel of Red Oxx Manufacturing in Billings, which makes sturdy luggage, was operating like a small company, thinking he didn't need the manufacturing systems that large companies use. When Al Delbert from MMEC arrived at Markel's door in 1996, Markel employed two workers, and he didn't see how operating like Toyota would make a difference in his productivity.

"If you are adding value with a process, you are a manufacturer," Markel said. "If you can make 20 fenders in an hour but can only paint two in the same amount of time, you're losing money. Too much work in progress eats your lunch."

Joyce Morehouse, checker at Gordon's Warehouse Grocery in Glasgow, holds a package of Granrud's Lefse.
Now Markel puts a number to everything, and his efforts have paid off. His Pr5 Safari Beano received “Gear of the Year” recognition in the 2004 spring issue of Outdoor Buyers Guide and passed rigorous lab tests at the Army Natick Soldier Center in Natick, Mass. The Red Oxh bag beat the overseas competition in design, materials and construction.

At Big Sky Woodcrafters in Laurel, a simple change like turning a table saw around increased productivity because the machine was no longer in the way of other equipment. “When we moved the saw, the footprint changed, productivity increased, and we began getting organized,” said co-owner Kathy Barta.

Barta and her husband bought the company in 1995 and struggled with pricing and costs until they finally sought help from MMEC. A cost-of-goods study gave Barta a financial management tool to better compete in a market heavy with foreign labor. BSW now focuses on custom items. “I now know which products make the best profits,” Barta said.

Jason Cajune at Montana Boatbuilders in Livingston thought big about boats. His family ran a 45-foot long tour boat in Glacier Park for more than 30 years. But he thought too small where his business was concerned. Like Red Oxh, he was encouraged to operate like Toyota. Once he began to evaluate materials usage and time tracking, it helped him realize cost and time efficiencies.

MMEC engineer Brian Fendergast saved Cajune thousands of dollars, Cajune said. “Brian took on the monumental task of evaluating our processes from milling raw wood and making finished pieces to composite fiberglass lay-up, and coating and finishing work,” Cajune said.

When Montana Boatbuilders built their new building at the end of last year, MMEC and its companion program, the University Technical Assistance Program, helped plan the layout, how to use each room, the placement of machinery and the flow of work space. Instead of 12 to 15 boats a year, the company now produces 20 to 24 custom boats and the same number of boat kits.

MMEC has reached out as far as Opheim in the northeast corner of the state where Granrud’s Lefse produces up to 55,000 one-pound packages of lefse every year. Lefse is a Norwegian flatbread made from potatoes. Owners Twyla Anderson and Alice Redfield operate the sea-sonal business in a garage, its original home since 1977.

MMEC engineer Dale Detrick analyzed each lefse-making step for time, efficiency and cost. With his help, plans for a new building were drawn, but bids proved too costly. To boost sales for the new building, the company completed a marketing analysis. Lefse packaging and the Web site both got a face-lift, which increased demand and led to plans to automate the original 1977 rolling machine.

Feedback from manufacturers tells MMEC its efforts are paying off with customer satisfaction scores ranking best in the nation among similar centers.

Its investment leverage ratio, an indication of how well MMEC clients have succeeded, ranked second best nationwide. Both measures come from recent federal National Institute of Standards and Technology/Manufacturing Extension Partnership impact measurement systems.

This is nothing short of stellar performance.

“When you consider there are 59 centers (like MMEC) most with more and larger manufacturers, this is nothing short of stellar performance,” says MMEC director Steve Holland.

To provide more opportunities for state manufacturers, Holland now is involved in an effort called MilTech Extension.

“MilTech helps companies with new and innovative technology to overcome technical or logistical difficulties for meeting Department of Defense contract requirements,” Holland said.

A unique partnership with the MSU Techlink Center, MilTech has helped eight Montana companies since it started just over a year ago.
COMMUNITY PROJECTS NAIL DOWN LESSONS
by Carol Schmidt

Often, college lessons are the stuff of dreams, practice projects and imagined efforts that help prepare a student for life's work.

That is particularly true at most architecture schools, where students learn about their solid art by building theoretical structures in computer programs or crafting miniature Styrofoam and basswood models.

But that isn't the case at Montana State University, where for the past two years students in both the College of Architecture and the College of Engineering have helped design and construct buildings vital to Bozeman community service.

MSU School of Architecture students recently put the final touches on a 2,700 sq. ft. addition to the Gallatin Valley Food Bank. The project, which doubled the food bank's size and increased the organization's storage space five-fold, was designed and built by School of Architecture students. Key structural input came from MSU civil engineering students.

It was the second community project for the students. Last year MSU architecture/engineering students planned and built an annex to the Network Against Sexual and Domestic Abuse shelter in Bozeman.

Christopher Livingston, a 1985 graduate of and professor in the School of Architecture, organized and directed the two projects. Livingston was at the Food Bank site daily during the summer, shepherding the construction work done by the 21 student volunteers who donated 7,600 hours to complete the project.

"These projects are a powerful way for the students to see how buildings actually come together," Livingston said. "We've done steel erection and concrete work, things they wouldn't normally be involved in on a construction site. They've seen the full spectrum of construction with this project."

The project includes a large warehouse area with natural light and radiant floor heating, a weighing station and truck bay, and a sorting area with a clever pivoting door. The new design also will allow Food Bank clients to browse and take their allotted amount of food rather than receive a pre-loaded box, as has been the practice in the past.

"This is an incredible operation," Livingston said, adding that four community service organizations work out of the facility—Paul's Soup Kitchen, school lunch in the summer and the Senior Program as well as the Food Bank. "They do some incredible things and they deserve a nice facility."
Chris Livingston said architecture students benefit from real-world experience such as the additions to the local food bank and domestic abuse shelter.

Among the most important lessons on the project, Livingston said, was a glimpse at realities most students don’t see.

“It’s been good for the students to learn about non-profits. Hopefully, it gives them a good view of how big the world is and how fortunate they are.”

While pounding nails into two-by-fours enriches the education of students who had only known about buildings from behind a drafting board, so does the experience of meeting budget and time constraints, Livingston said.

It was also good for the non-profit, according to Heather Grenier, director of the Food Bank. Grenier said having students design and provide construction labor saved the organization nearly $100,000.

“Just in architectural plans and engineering, using students saved us about $40,000 and another $60,000 in labor over the summer,” she said. The total budget for the project was $150,000, including some funding from a federal grant, “which is a great price for a 2,700 sq.-ft. addition.”

The project began when Grenier’s organization sought the advice of the MSU Design Center about expansion and the College of Engineering’s industrial engineers for an efficiency study. Livingston learned about the project, which was just the kind of venture he was seeking for his senior design class. The class, primarily composed of architecture graduate students, designed the building last spring. The plans then were passed to Jerry Stephens, an MSU professor of civil engineering, who supervised two engineering graduate students as they worked on the structural design and filed plans with the City of Bozeman.

“I’m not sure there is anything that would be better experience for a student from a structural engineering perspective,” Stephens said. One of the two students, Jeff Johnson of Bozeman, said the job helped him prepare for his position at Bridger Engineering, which also helped consult on the project.

Concrete Accessories donated concrete forms and someone to instruct the students how to install them properly.

“It may not mean a lot to the students right now, but I expect that this experience will give these students an advantage years from now when they are in an architecture practice or working on their own projects,” Livingston said. “These are the problems that they will see in the future. And as teachers, to prepare them for those realities is all we can hope for.”

With hammer and drill in hand, Simoneau (left) and Johnston learned practical construction skills, something that will help them when they are architects, they said.
A pale and thin man given to catching cold and prone to hystericls, Ivan ate little and slept badly. After a prolonged episode of strange behavior, his concerned landlady called Dr. Rabin, who sent Ivan to a hospital for treatment. The relationship that evolved between doctor and patient is immortalized in "Ward 6," a short story by Anton Chekhov, who was a physician as well as one of civilization's great writers.

Such interaction between doctor and patient has been the grist of literature. Recently, however, the doctor/patient relationship has become the primary focus of medical humanities, an interdisciplinary melding of science and art, according to Kimberly Myers, an English professor at Montana State University. Myers studies, teaches and writes about medical humanities in addition to her work in English and Irish literature.

"Medical humanities works to re-humanize medicine, to remind physicians that while science and technology are important, flesh-and-blood human beings are still the heart of medicine," explains Myers. She teaches a medical humanities course to first-year medical students from Montana enrolled in the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) program at MSU. The award-winning professor uses literature, film, patient narratives and case studies to focus on such issues as patient care and ethics.

"It was courageous on WWAMI's part to offer these courses so that students can think about these issues from the start," Myers said.

Myers said that top medical schools began to include medical humanities courses and curricula in the late 1960s because medicine had become increasingly limited to curing a disease at the expense of caring for the physical and emotional well-being of the patient.

"Before the mid-19th century, physicians were caring for patients at the bedside," Myers said. "But in the mid-1800s, rapid advances in instrumentation and laboratory sciences took the doctor from the bedside into the lab. The patient became almost incidental. The goal of medical humanities is to restore a healthy balance of science and compassionate attention."

Dr. Herbert Swick, a physician at St. Patrick Hospital in Missoula, concurs. Swick, the executive director of St. Patrick's Institute of Medicine and Humanities, a joint project with the University of
DON'T FORGET THE PATIENT
by Carol Schmidt

Montana, said medical humanities counterbalances the highly technical aspects of contemporary medical education.

"It is so easy to become divorced from the patient as an individual because so much of what one needs to do involves diagnostic technology," said Swick, who both teaches at UM's Davidson Honors College and is a member of the clinical faculty at the University of Washington School of Medicine.

"In my mind, we can never separate the technology that we bring to health care today from the fact that it (medicine) is still dealing with the very intimate condition of people's lives," Swick said. "Medical humanities can help maintain the human face of medicine that reminds physicians and other health care providers that a very important personal relationship occurs to make healing possible."

Myers developed an interest in medical humanities while she was treated for a medical condition several years ago. It occurred to her that the way a patient uses language has a dramatic impact on the treatment she or he receives. As an English professor, she developed a scholarly interest in pathographies, or patients' stories.

"They reveal a lot about how the patient thinks of his illness," she said. "These clues can help a physician understand how to work with that particular patient so that he gets the best possible care."

Myers requested personal illness narratives from fellow academics. Both the number of responses she received and the power of the work astounded her. These essays, from scholars all over the world, will appear in the book "Illness in the Academy," scheduled to be published in 2006 by Purdue University Press. The book will be used in medical schools for physician education.

Myers' book includes a previously unpublished poem by the Irish poet and Nobel laureate Seamus Heaney as well as a poem by physician and writer Dr. Abraham Verghese, an international leader in the field of medical humanities. Verghese is an award-winning writer of "My Own Country," a memoir of the beginnings of the AIDS epidemic in rural Tennessee. Myers worked with Verghese last summer, and he is scheduled to speak at MSU in April.

Medical humanities can help maintain the human face of medicine.

In addition to teaching medical humanities to medical students, Myers has also taught seminars in "Literature and Medicine" for the English Department and "Medicine, Literature and Culture" for the MSU University Honors Program, where she is currently associate director. Myers said she believes that all students benefit from the study of medical humanities because it not only enables them to consider topics from different perspectives, but also empowers them as current or future health-care consumers.
DEAD COWS, LIVE CROCS REVEAL DINOSAUR SECRETS

by Evelyn Boswell

Frankie Jackson and David Varricchio followed a trail of rotting cows to see how a river deals with the unsuspecting animals it traps. Ewan Wolff called on thousands of Australian crocodiles to find family resemblances to extinct cousins. Mary Higby Schweitzer retrieved a decaying ostrich from the back of a South Carolina barn and peered inside its leg bones.

"It was the craziest thing I have ever done," Schweitzer said as she described the path that led to her discoveries about an eastern Montana dinosaur called B. rex.

There's a lot of stuff you can read about, but it's a lot more useful to actually see what they do.

Scientists who investigate animals that have been dead for 65 million years sometimes look for clues among the living or at least the more recently deceased, said Montana State University paleontologists who have dug and mapped dinosaur remains all over the world.

Jackson and Varricchio are among the MSU scientists who have turned to more modern animals in their quest to understand dinosaurs. Wolff, an MSU graduate student, and Schweitzer, a former MSU graduate student, do the same.

"The simultaneous drowning of these cows provided a unique opportunity to examine the consequences of mass death within a fluvial system," Varricchio said about some 40 cows that died last year after breaking through the ice on the Yellowstone River north of Glendive.

"These cows attempted to cross the frozen edge of the river to drink at a still open stretch," Varricchio explained in a paper he presented to the Society of Vertebrate Paleontology in October. "The herd broke through the ice, drowned and became entrapped beneath the ice. Here they remained for over a month until the spring melt, when the river, freed of its ice jam, distributed the carcasses downstream."

Varricchio and Jackson realized the potential of the incident that occurred near the end of the 2003-04 winter, so canoed down the Yellowstone River in May 2004 to see if they could find any remains. Successful even during the high waters of paddlefish season, the paleontologists returned two weeks later with students who were
Evan Wolff holds a crocodile displayed at the annual conference of the Wildlife Disease Association. The conference was held in Australia where crocodiles are raised for meat and leather.

attending MSU’s paleontology field course in Glendive. They made a third trip in September 2004, a fourth in May 2005 and a fifth this September.

“Catastrophic mass drownings have been inferred for a wide variety of vertebrates from titanothere to hadrosaur dinosaurs, but relatively little modern data exists for comparison,” Varricchio said.

Varricchio and Jackson found 33 cows spread over 25 miles when they first canoed the river. Nearly all were intact and severely bloated. Several had unborn calves. The paleontologists found groups of two to five cows as far downstream as 18 miles.

By late September 2004, Varricchio and Jackson found only 17 carcasses, but some of them remained in groups. The most complete carcasses were held together with stiff upper skins, raising the possibility of someday finding dinosaur “mummies,” Varricchio said. Skulls were relatively
scarce, but ribs and shoulder blades were unexpectedly plentiful.

The discovery of groups was important, Varriichio said, because dinosaur bones have been found that way. It supports the theory that mass deaths may have been responsible.

Wolff, Varriichio’s graduate student, normally focuses on wounds and lesions in dinosaur jaws and traveled to Australia this year to present his research at the annual conference of the Wildlife Disease Association. In his spare time, though, he observed emus, turtles, lizards, marsupials and cassowaries to see what the primitive animals and birds could teach him about dinosaurs.

He also dropped by crocodile farms and zoos and studied crocodiles in the wild. He photographed crocodile homes and the belly marks they left by sliding down muddy river banks. He consulted veterinarians who treat crocodiles in captivity or encounter them in nature.

“There’s a lot of stuff you can read about, but it’s a lot more useful to actually see what they do,” said Wolff who noted that Australians raise crocodiles for meat and leather, so it seemed logical to investigate the animals while he was in the country. He observed crocodile personalities, their injuries and wounds. He gained new perspectives by watching crocodiles eat, move, sleep and snap.

He noticed, among other things, that a crocodile’s life isn’t always dramatic. It was probably the same for dinosaurs, Wolff said. Just because a paleontologist finds a punctured dinosaur jaw doesn’t necessarily mean it resulted from a fierce battle, for
example. The dinosaur could have hurt himself by ramming into a tree or chewing a rib. In the same way, most of the infections Wolff saw in crocodiles had more to do with diet than injuries. Perhaps it was that way with dinosaurs.

Schweitzer, now a paleontologist at North Carolina State University and the North Carolina Museum of Natural Sciences, did she knew as soon as she opened a box of bone fragments that she was looking at a female dinosaur. She had examined enough bird bones and knew enough about bird biology to recognize the medullary tissue that lines the inside of bone marrow cavities when birds are laying eggs.

She often looks at ostrich and emus, because they are primitive birds that have more in common with dinosaurs than more advanced birds like robins, Schweitzer said. To find the ostrich whose bones she compared to B. rex, she searched the Internet for an emu and ostrich owner site. Then she asked if anyone had birds that died recently during an egg-laying cycle. The outcome was a call from a South Carolina farmer and a decomposing ostrich that yielded the same kind of tissue she saw in B. rex.

Once again, a dinosaur relative had come to the aid of a dinosaur researcher.

This last year was a big year for paleontologists who examined the bones of an eastern Montana dinosaur named B. rex.

Not only did they find soft tissue preserved in the oldest Tyrannosaurus rex on record, but they discovered that B. rex was a she. Two papers on the findings were published within three months in the journal Science. Mary Higby Schweitzer was the lead author for both papers, and Jack Horner was co-author.

Discover magazine ranked the soft tissue finding as the sixth most important scientific story in 2005.

Schweitzer, a former graduate student at Montana State University, is now a paleontologist at North Carolina State University and North Carolina Museum of Natural Sciences. Horner is curator of paleontology at MSU's Museum of the Rockies.

B. rex was named after Bob Harmon who found the dinosaur in 2000 after hiking into a steep box canyon north of Jordan. Harmon is chief preparator of paleontology at the Museum of the Rockies.

While studying B. rex's hind thigh bones, Schweitzer found that both contained preserved soft tissue. The bones also held transparent, flexible, and hollow blood vessels with round microscopic structures inside. The structures looked like cells, leading the scientists to believe that some dinosaur soft tissues may keep a portion of their flexibility, elasticity and resilience even after 68 million years.

"I see this as a really important discovery that will change our methods of collecting and study," Horner said. "We can truly begin asking biomolecular questions. The discovery also means that our preconceived ideas about preservation were wrong."

The realization that B. rex was a female resulted from seeing medullary tissue lining the inside of the dinosaur's bone marrow cavities, Schweitzer said. Common in female birds, the tissue keeps birds from losing calcium while laying eggs. Schweitzer had seen it many times in birds and expected it would show up someday in dinosaurs. When she opened a box of bone fragments from Horner, she knew that day had arrived.

"We have a girl," Schweitzer told her technician, another co-author of the Science papers.

Schweitzer was in Montana last summer, visiting field sites and using MSU laboratories to further analyze the B. rex bones. It was an exciting time that yielded important findings she expects to announce in the future, Schweitzer said.
Jackie Allen is probably smiling in the wintry photograph. Joining a research team that launched balloons from the Arctic was the opportunity of a lifetime, after all, the Montana State University senior said in her e-mails from the Polar Bear Capital of the World.

But expressions are hard to read on a face that's reduced to a pair of squinting eyes. The Arctic in January calls for hats and facemasks and a system of buddies who will check each other for frostbite. It means 3 p.m. sunsets and wind chills that can reach minus 90 degrees Fahrenheit. Snow shoots under doors and piles up toward windows as if it, too, were trying to escape the outdoors.

Despite the conditions and in some ways because of them, Allen and Kim Cochran traveled to the Arctic this year to send helium balloons high into the sky to measure x-rays in the upper atmosphere.

About the same time, Brianna Arnold and Delisa Rogers returned from Antarctica where they drilled deep into the ice-covered lakes to sample water for renowned polar biologist John Priscu of MSU. During an Antarctic spring and early summer, the sun shone 24 hours a day, making it hard to sleep but easy to work until midnight. The unhampered wind ripped through field camps. Permafrost prevented stakes, so the cold weather campers tied their tents to boulders.

MSU students have gone all over Montana for research. They've ventured to the coasts and sometimes out of the country. But in the past year, undergraduates have literally gone to the ends of the Earth to help solve some of the mysteries of the planet.

"It was a great experience, a great opportunity. If I had a chance to do it again, I would in a heartbeat," said Allen, a native of Salt Lake City.

"To be able to go out into the world and see firsthand things you've only read in a book, it's quite an experience," said Cochran of Great Falls. "Being here has also given me a sense of how I would like to conduct my own research when that time comes."

Allen and Cochran both worked in the Arctic with Dave Klumpar, director of the Space Science and Engineering Lab at MSU. Klumpar, responsible for several projects that involve undergraduates in space-related projects, arranged for MSU's involvement in the Arctic launch. He had met Robyn Millan of Dartmouth College at various conferences and brought up the possibility of MSU students joining her in the Arctic. Millan agreed, saying she could certainly use the extra hands.

Allen, Cochran and Klumpar headed for the Arctic last January. Working out of the Northern Studies Centre in Churchill, Manitoba, they prepared payloads and mapped winds. Allen helped lay out the balloons; Cochran helped release them. The students took photos and wrote daily Internet reports of their experiences. The Montana Space
Grant Consortium paid the students’ travel expenses and awarded each $500.

“It was great to have them. They were not only incredibly enthusiastic and had a great time, but they did a lot of terrific predictions for us,” Millan said months later as she continued to analyze results and make plans for her next x-ray project.

Millan’s project involved multiple universities and simultaneous balloon launches from the Arctic and Antarctica to help her measure the energetic x-ray bursts that result from electrons trapped in the Earth’s radiation belts.

One balloon from the Arctic and two from the Antarctic detected an extremely large solar flare on Jan. 20, 2005, Millan said. The flare produced a large geomagnetic storm on the Earth and lots of aurora lights with highly-energetic proton particles from the sun. Researchers are interested in such information because x-ray bursts can damage satellites and disrupt communication, she said.

On the opposite side of the globe, Arnold and Rogers spent more than two months last winter collecting water samples from the ice-covered lakes of the McMurdo Dry Valleys.

Part of a field team that involved Amy Chiuchiolo and Joel Moore of MSU, they were based at the McMurdo Station, but lived at field stations while sampling Lakes Fryxell, Hoare, and Bonney.

To learn the necessary survival skills, the newcomers attended “Happy Camper School” in Antarctica. Field station life itself meant sleeping in tents, driving a six-wheel vehicle across the jagged ice and cooking in an old army shelter known as a Jamesway.

To take their samples, the researchers used gas-powered augers to drill through about 23 feet of ice. Then they used a winch to move sample bottles close to the bottom of the lakes, sometimes passing the bottles through as much as 80 feet of water.

One of Priscu’s many Antarctic projects is a Long-Term Ecological Research project that looks at microbial life in the Dry Valleys.
To be able to go out into the world and see firsthand things you’ve only read in a book, it’s quite an experience.

Brianna Arnold by Taylor Glacier at the west lobe of Lake Bonney in Antarctica.

lakes. That means he needs regular sampling to follow biological and chemical changes, said Chiuchiolo, a research associate who led the MSU field team.

"It was a once-in-a-lifetime experience that most people don't get," said Arnold of Sheridan, Wyo. "I'll always have that interesting answer for, 'What have you done?'"

"I truly loved every moment in Antarctica (excepting those where I woke up in the middle of the night, needing to force myself out of bed to use the restroom)," said Rogers, a native of Albuquerque, N.M. "I think the main reason that I enjoyed the experience so much was because of the team that I worked with."

Besides the field team, Rogers referred to Priscu ("an absolutely amazing mentor") and Jill Mikucki ("one of the brightest scientists I've met").

Since returning from Antarctica, Rogers has graduated from MSU and finished an internship with the Idaho National Laboratory. She plans to pursue graduate school, but is looking at research jobs in the meantime.

"I feel that my Antarctic experience has greatly influenced my career goals," Rogers said. "I started out wanting to pursue land reclamation/mine remediation. However, after experiencing a more focused project in the microbiology of lakes, I have decided that I would enjoy research in microbial ecology."

Arnold, now a senior at MSU, said, "It's not easy to get to Antarctica. When people see that on my resume, I think it will give me more advantages over somebody that doesn't have any field research experience."
Researchers Drive the Extra Mile for West Nile

by Evelyn Boswell

Five Rhode Island Reds spent their summer at the beach trying to attract fly-by-night mosquitoes in the name of science. Surrounded by swaying wild flowers, they laid eggs. They clucked. Their feathers fluttered in the breeze.

Living in a cage inside a kennel and protected by the same electric fence that keeps predators off Pelican Point, the chickens were there to intercept some of the mosquitoes that carry West Nile virus at the Medicine Lake National Wildlife Refuge in northeast Montana, said Greg Johnson, a Montana State University entomologist.

"It's been obvious over the past couple years that the mosquitoes are actively hunting for pelicans to feed on," Johnson said.

If the chickens became infected, he would learn more about the virus that killed four humans, 70 horses and more than 1,000 pelicans in Montana in 2003, Johnson said. Chickens are used in virus surveillance programs because infections appear in them several weeks before they show up in humans and horses.

Johnson knows that the Culex tarsalis mosquito is the primary carrier of West Nile virus in Montana and that it mainly flies between 10 p.m. and 1 a.m. Johnson doesn't believe the virus survives Montana's winters, which suggests to him that birds carry it into the state. He thinks birds and animals may develop some immunity to the virus.

He predicts that low levels of the virus will stay in mosquitoes and birds until another heat-drought cycle pushes it back into humans and horses.

"Ultimately, I think West Nile virus will drop out of sight and then all of a sudden, it will pop up again, and it will be a repeat of 2003," Johnson said as he drove through the refuge to visit the chickens. "It might be next year or 10 years down the road."

On a foggy summer day, whitecaps slapped the shore near Pelican Point as mosquito traps blew sideways. Johnson and graduate student Kristina Hale turned their backs to the wind as they took blood samples from the chickens. That finished, they checked mosquito traps on the way back to the refuge headquarters.

Johnson began studying the relationship between West Nile virus and mosquitoes in 2003. This year, since Medicine Lake was one of last year's hot spots, he placed two pens of chickens at the refuge as well as mosquito traps and fiberboard containers. Hale drove from Bozeman to Medicine Lake every week to check the chickens, empty mosquito traps...
traps and vacuum mosquitoes out of the fiber pots under bushes. Besides Pelican Point, chickens at the refuge were placed in an island of trees at Tax Bay.

Elsewhere around the state last summer, Johnson placed three pens of chickens on the Yellowstone River and one on the Milk River near Fort Belknap. He and cooperators trapped mosquitoes at approximately 30 sites in eastern Montana and 25 sites west of the Continental Divide. They trapped along the Milk and Yellowstone rivers, in three wildlife management areas (Medicine Lake, Freezeout Lake and Nine Pipes Reservoir) and 14 state parks.

By late August, Johnson had found a number of mosquitoes that tested positive for the virus and two chickens. The infected mosquitoes were trapped along the Milk and Yellowstone rivers and the Medicine Lake refuge. They were found around Glasgow, Terry and Miles City. The infected chickens were part of the Terry flock.

"We know there's activity," Johnson said on his way to check another trap. "We are trying to see how long it's going to last. It's starting to cool off now and that's going to suppress the virus activity. looking back at the weather data in 2003 when the activity was pretty high, we had temperatures in the 90s and 100s throughout the month. We are now getting temperatures in the 70s and 80s. I think temperature plays a big role in the prevalence of the virus."

Another field season almost finished, Johnson said he would have to scale back his research because of funding cuts by the Centers for Disease Control and Prevention. He plans to continue his work in wildlife management areas and other virus hot spots, however.

"The more we learn about this animal, this insect, the better we will understand how we can attempt to control both the nuisance aspect as well as the disease," Johnson said.
Malt barley production has traditionally thrived in the Red River Valley area of North Dakota. But a devastating disease from heavy moisture in that area is moving the crop west, which is good news for Montana farmers.

"Scab rarely develops in Montana’s dry summer climate," said Tom Blake, Montana State University barley breeder. Scab is the disease responsible for spoiling much of the barley in the Red River Valley. "Also, the farmers here are great at managing soil fertility and keeping the protein where it needs to be for malting barley."

Producers have grown malt barley for decades, but they could get a big boost from the state’s first malting plant, International Malting Company (IMC), located in Great Falls.

Malt, made from barley, provides the enzymes, starch and protein that feed yeast and result in alcohol production in beer, said Blake. Malt also contributes color, body and flavor to the brew.

Using the same tools as in the human genome project, Blake has developed two new malting barley varieties that do well in dryland production environments like Montana. The first of these—Craft—should be in commercial production in spring 2007.

The goal is to make malt barley a key rural development tool for rainfed crop production in the state, where long-term temperature and precipitation trends are expected to favor the crop.

The work is similar to ongoing efforts to breed barley varieties that make feed barley equal to corn as cattle feed. Funds have come, in part, from the U.S. Department of Agriculture.

Other scientists in the Montana Agricultural Experiment Station and Agricultural Research Centers are involved in testing new malt barley varieties and developing effective and cost-efficient cropping and weed-management systems.

Grant Jackson at MSU’s Western Triangle Research Center in Conrad has done two
years of field tests aimed at fine-tuning malt barley planting and fertilizer rates to maximize available rainfall.

At the Southern Agricultural Research Station in Huntley, weed researcher Steve King has been working with two experimental herbicides to gauge their effectiveness against wild oats. Wild oats can threaten malt barley yields and reduce prices.

Also at Huntley, superintendent Ken Kephart has done extensive malt barley trials in conjunction with Tom Blake’s variety development.

In Great Falls, IMC plant manager Mark Black said the plant expects to employ 35 people and process about 12 million bushels of barley each year.

“We will purchase the grain as close to the facility as possible,” Black said.

Malt from IMC will be freighted to breweries, distillers and food customers. IMC supplies malt to some of the largest brewing companies worldwide, including Miller Brewing and Anheuser-Busch in the United States.

Black said IMC chose Great Falls for its plant for three reasons. “Great Falls is the best region for two-row malting barley and offers the best availability of water and utilities,” he said.

Richard Owen, executive vice-president of Montana Grain Growers Association (MGGA) and Chairman of the Great Falls Chamber of Commerce, agrees. “The Great Falls location supplies IMC with plenty of barley, clean water from Giant Springs, lots of electricity and good rail transportation,” he said.

“With a plant in Montana, farmers will not only save on freight, but the higher demand will bring more contracts and, consequently, greater price stability,” said Dave Henderson of Cut Bank. Henderson grows 2,000 acres of malt barley every year.

“Another benefit for farmers is malt barley requires less fertilizer than wheat, and fertilizer is costly,” Henderson added. Malt barley is also insurable through the federal crop insurance program.

Herb Karst of Sunburst owns 1,800 acres of malt barley and is under contract with Coors and Anheuser-Busch. As past president of MGGA, he worked hard to bring the Milwaukee-based IMC to Montana.

“Farmers growing solely wheat will stay with that crop, but those growing a percentage of both will increase their malt production,” Karst said.

Looking into the future, Blake sees positive outcomes for farmers and the state’s economy. “It’s possible that the Great Falls plant will out-compete the older malting plants in the Midwest, as the plant is high-tech with less cost per production,” Blake said.

“IMC will produce 30 percent more malt than our industry can consume,” Blake continued. Consequently, because malting is an expensive process, IMC will need to find a place to sell outside the United States. China and South America are potential customers.

“The overall outlook is positive for Montana,” Blake said. “We can maintain our farmer’s advantage by producing varieties that meet the quality profile needs of the brew masters while also fitting Montana’s climate.”
STUDENT TO FILM FORMER SOVIET NUCLEAR TEST SITE

Anne Devereux, a graduate student in MSU's Science and Natural History Filmmaking program, won a Fulbright to make a documentary film in Kazakhstan. The film will focus on a former Soviet atomic testing site and the effects of nuclear proliferation. Devereux will travel to Kazakhstan early 2006 to make the film, examining the nuclear legacy and current status of the Semipalatinsk Test Site. The site is an 11,000 sq.-mile-area on the isolated steppe of Kazakhstan where the former USSR developed and tested its nuclear weapons. Devereux will live and work in the country for six-months.

MEDICAL APPLICANTS GAIN ACCEPTANCE

Eighty-three percent of medical school applicants from MSU's Bozeman campus were admitted to medical school in 2004, compared with 47 percent nationally.

The statistics from the Association of American Medical Colleges are even better for MSU students who are also Montana residents. They were accepted to medical school 89 percent of the time. About one-third of MSU grads in medical school attend through the WWAMI Medical Education Program at the University of Washington Medical School. MSU applicants to osteopathic schools had an 83 percent acceptance rate. Those applying to dental schools had a 74 percent acceptance rate. Both were "well above the national average," said Jason Cary, MSU health professions advisor.

MSU SCIENTIST ADVISES INTERNATIONAL PANEL

Prion diseases such as chronic wasting disease in deer and mad cow disease in cattle occur around the world. To update its public health recommendations on prion diseases, the World Health Organization brought between 30 and 40 scientists to its headquarters in Geneva, Switzerland, in September. MSU veterinary molecular biologist Richard Bessen was among them. He presented information on prion infection in skeletal muscle, which has implications for food safety. Another concern is prions in the blood. Two people worldwide have contracted human prion disease, called variant Creutzfeldt-Jakob disease, from blood transfusions. Bessen said the WHO panel will use the scientists' reports to update information on the distribution of prion infectivity in human and animal tissues. This information was last reviewed about two years ago.

$17.9 MILLION GRANT AIMED AT CLIMATE CHANGE

The U.S. Department of Energy awarded $17.9 million to a multi-state partnership headed by MSU to further develop ways of capturing and storing greenhouse gases, especially carbon dioxide, in underground geological formations, crop land and forestland. The regional coalition, called the Big Sky Regional Carbon Sequestration Partnership, includes public- and private-sector research institutions, businesses and state agencies. It is part of a national network of such partnerships that is the backbone of the United States' sequestration research.

MSU economist Susan Capalbo, director of the partnership, said this work shows that MSU is becoming known as a leader in energy research. The grant will help America take a huge step toward significant greenhouse gas reduction while using coal and other fossil fuel resources, Capalbo said.

STUDENTS TAUGHT TO ‘DESIGN LIKE THEY GIVE A DAMN’

While teaching at the MSU College of Architecture in 2005, internationally acclaimed architect Cameron Sinclair also transplanted his Architecture for Humanity to Bozeman. As a result, Sinclair involved MSU architecture students in AFH projects around the world. AFH is a nonprofit organization that provides design for international communities in crisis. Its slogan is "Design Like You Give a Damn." One of the student projects, an adaptable 500-sq.-ft. home for Sri Lankan tsunami survivors, won first prize in the shelter category at a recent Scientific International Design competition. MSU's American Institute of Architecture students raised $3,500 last spring for one of their projects, a proposed school for children of prostitutes in Calcutta as featured in the documentary "Born into Brothels." Sinclair recently received a 2006 TED Prize, which carries a cash award of $100,000 to support a world-changing idea.

A drawing of a one-story home for a family in the Ampara region of Sri Lanka. MSU students Jason Andersen and Peter Andrews worked on the award-winning design with others from Architecture for Humanity.

MONTANA BEING "STRETCHED APART"

Western Montana is earthquake country, but the frequent quakes in the area are usually moderately sized, like the one on July 25 centered north of Dillon, said David Lageson, an MSU geologist. Lageson, head of MSU's Earth Sciences Department and an expert in tectonics, said the area has "a whole lot of little faults rather than one big one like the San Andreas fault. Montana is being stretched apart," he said, adding that Yellowstone National Park's thermal features are the result of that expansion and that "the very bottom of the Yellowstone hot spot is 200 to 300 kilometers under Dillon.” Lageson's research contributes to better seismic risk assessments in the region.
LIBRARY RECEIVES
YELLOWSTONE COLLECTION
COURTESY OF M.S.U. LIBRARIES SPECIAL COLLECTIONS

A food coupon book from Civilian Conservation Corps in Yellowstone National Park circa 1930, is among new items in a Yellowstone National Park historical donation from the Aubrey M. Haines collection.

Last spring, MSU’s Renee Library received most of the Aubrey M. Haines’ collection of historical documents and memorabilia on Yellowstone National Park. The collection soon will be available to researchers, scholars and students. During 32 years with the National Park Service, Haines wrote six books and many articles. As the park’s first official historian from 1959-69, Haines scoured the park’s archives and beyond for Yellowstone’s cultural history. With the donation, MSU now has one of the finest collections of Yellowstone research in the world, according to Kim Allen Scott, MSU special collections librarian and university archivist.

HELENA STUDENT LATEST
GOLDWATER SCHOLAR
Bridgid Crowley, a Helena native majoring in biochemistry, received a prestigious Barry M. Goldwater Scholarship for undergraduate excellence in math, science and engineering. Crowley, along with 320 students in the nation, won the 2005-06 scholarship that pays up to $7,500 a year for two years of undergraduate education. Almost 2,000 applied and Crowley, with a 3.94 GPA, was the only Montana recipient. Crowley was the 44th MSU student to receive the award since the Goldwater program began in 1986. MSU is one of the top dozen institutions in the nation for producing Goldwater scholars along with Harvard, Princeton and Duke universities.

STUDENT-DOCTOR TEAM
WAGES WAR ON WOUNDS
Owing to poor circulation that afflicts many diabetics, foot sores can develop into painful skin ulcers. In severe cases, doctors might recommend amputating the foot, said Garth James, director of medical projects at MSU’s Center for Biofilm Engineering. But an MSU undergraduate’s work could lead to different wound treatments for diabetics. Ellen Swogger found that 60 percent of tissue samples from diabetics’ wounds had biofilms. Biofilms are sticky clusters of bacteria that resist antibiotics and other treatments. Dr. Randall Wolcott of the Southwest Regional Wound Care Center in Lubbock, Texas, began treating the ulcers with specific biofilm-fighting strategies after contacting the center for help. Center scientists are preparing a scientific paper on what they’ve learned so far, with Swogger as co-author.

RESEARCHERS FIND ANSWERS TO ANIMAL ID QUESTION
Montana researchers answered important questions raised by the proposed creation of a national livestock identification program. They now know it’s possible to scan electronic ear tags while animals are moving, that handheld wand-scanners work better than other scanners and that metal fences can interfere with scanners. They tracked cattle, with 90 percent accuracy, from a ranch in one state to a pasture in another state to a feedlot in a third. Researchers with the Montana Beef Network conducted three studies this year that produced those results. John Paterson, director of MBN and MSU Extension beef specialist, said. Based at MSU, the network operates in close partnership with the Montana Department of Livestock and the Montana Stockgrowers Association.

ORAL HISTORY PROJECT STARTS WITH MONTANA WOMEN
Nineteen MSU students chose female neighbors, relatives, church friends or other acquaintances to interview for an oral history project in women’s studies. Most of the women were from Montana, and each had to be at least a generation older than the student interviewing her. The women shared their first impressions of husbands, their most vivid memories from childhood, their memories of their mothers and their childhood chores. MSU history professor Mary Murphy created the class project, which is part of the university’s new Core 2.0 program. The oral histories will be housed in the MSU Renee Library, where the collection can build.
Western Transportation Institute researcher Laura Stanley checks results of a driver-safety-cell-phone study at the MSU-based center.

**RURAL DRIVERS USING CELL PHONES CAUSE ACCIDENTS**

Rural drivers using cell phones while driving are nearly four times more likely to cause automobile accidents than rural drivers not using cell phones, according to a recent study by the Western Transportation Institute based at MSU. WTI researcher Laura Stanley compares the level of distraction to driving while intoxicated. The study also showed that drivers are equally distracted with hands-free calls as they are with hand-held.

**HIGH SCHOOL STUDENTS SPEND SUMMER ON RESEARCH**

Through MSU's summer Montana Apprenticeship Program, 21 Native American high school students from Montana researched a variety of science and engineering topics from a greenhouse wetland to Sony's newest handheld videogame. Sponsored jointly by MSU's American Indian Research Opportunities and the Designing Our Community programs, the program introduces career options in science and engineering to students from rural communities. The teenagers spent mornings working on college prep activities that included math, chemistry, biology, engineering, writing and computer skills while afternoons were spent in labs with mentors. Funding comes from the William and Flora Hewlett Foundation's Engineering Schools of the West Initiative.

MSU will build a proposed $8-million Native American Student Center on the eastern edge of MSU's Centennial Mall.

"Because American Indians place a great deal of emphasis on cardinal directions, the building will sit on the eastern side of campus," said Henrietta Mann, special assistant to MSU President Geoff Gamble and professor emeritus of Native American Studies. She called it "a sacred position," adding that ceremonial lodges always open to the east. The location "just felt right," she said, especially after it served as the site of a teepee encampment during the 2005 MSU pow wow.

Sara Jayne Steen, dean of MSU's College of Letters and Science, says the university is raising private donations to fund the 12,000-15,000 sq. ft. center.

"What we plan is a wonderful, inclusive building that will be different from other buildings on campus," Steen said. "It will be beautiful and unique and a place to welcome Native students as well as bring to our non-Indian students a sense of the wonders of Native culture."

Walter Fleming, head of MSU's Department of Native American Studies, said that MSU has approximately 275 Indian students. Currently, the MSU American Indian Student Center is in the basement of Wilson Hall.

"It (the current meeting room) was built in the mid-'70s when Wilson Hall was built and when there were fewer than 25 Indian students," Fleming said. "It has to be one of the most-used spots on campus."

While approved by the Montana Board of Regents, the building will be funded entirely by private donations. Bozeman-area artist Jim Dolan and architect Dennis Sun Rhodes, a principal of AmerIndian architecture firm in Minneapolis, are helping spearhead the project.
WHIRLING DISEASE
RESEARCHERS FIND HOPE
IN MONTANA RESERVOIR

Rainbow trout in a Madison County reservoir gave a glimmer of hope to researchers trying to understand and stem whirling disease in Montana, said the state's whirling disease coordinator. "Rainbow trout that swim in the Willow Creek Reservoir are significantly resistant," said Richard Vincent of Montana Fish, Wildlife and Parks at Montana State University. Researchers haven't found a solution for whirling disease in Montana, but the trout warrant continued study, Vincent said.

The Montana Water Center, housed at MSU, recently dispersed $644,000 to ten research teams to study and conquer the complex disease. Whirling disease spread across most of the state since it appeared in Montana in 1994.

Leah Steinbach Elwell, whirling disease researcher, sorts worm samples on the Madison River in southwest Montana.

ORGANIC GOES MAINSTREAM

Montana grain growers led the nation in organic wheat production in 2004. "Organic systems have their most competitive edge in semiarid areas during below-normal or normal rainfall," said Perry Miller, MSU's cropping systems researcher. That describes most of Montana most of the time. Over the past five years, Miller has conducted research in the Gallatin Valley that compares an organic winter wheat production system to two no-till winter wheat systems. This research suggests that organic cropping systems are surprisingly competitive for Gallatin Valley producers, especially during drought. Both the Montana Farm Bureau and the Montana Grain Growers Association memberships have voted to encourage MSU to apply for grants to expand organic crop production research.

STUDENT FINDS VOLUNTARY LABELING INCREASED PRICES

When dairy companies voluntarily label milk as having no added bovine growth hormone, they increased sales and increased the price people were willing to pay for their product, an MSU master's student found. Critics claimed that injecting dairy cows with the genetically engineered bovine growth hormone, rBGH, leads to a human health hazard. Because of the claims, some dairy companies began to voluntarily label their milk as having been produced without rBGH. Former MSU student Kristin Kiesel and MSU economists Dave Buschea and Vincent Smith published a study based on Kiesel's master's thesis in the May edition of the "American Journal of Agricultural Economics."

PEDOMETERS ARE POPULAR, BUT ACCURATE TOO?

Walking is one of the most-often-recommended forms of exercise for healthy adults, says Dan Heil, MSU exercise physiologist. And for walkers, pedometers are a way of keeping score. Heil designed a study to see how long three different pedometers would remain accurate under normal walking conditions. A common goal for walkers is 10,000 steps, or about four miles, a day. With that as a baseline, Heil found that one brand lasted about six months. Another lasted for 710,000 steps or 1.4 years, and the third brand tested was still accurate after 2.4 million steps or about 45 years of walking. Another test, this time of 15 brands or models, will be completed later this year.

Dan Heil.
2005 FACULTY AND STUDENT AWARDS

FACULTY AWARDS

Cox Family Awards for Creative Scholarship and Teaching
Janice Bowman, animal and range sciences; and Gwendolyn Morgan, English.

Charles and Nora L. Wiley Faculty Award for Meritorious Research and Creativity
Neil Cornish, physics; Trevor Douglas, chemistry, and Franke Wilmer, political science.

James and Mary Ross Provost's Award for Excellence
Greg Francis, physics.

MSU Excellence in Outreach Award
Gordon Brittan, Regents Professor of Philosophy; Michael Vogel, MSU Extension Housing and Environmental Quality Specialist.

Provost's Award for Undergraduate Research/Creativity Mentoring
David Klumpp, physics professor and director of MSU's Space Science and Engineering Laboratory; and Kimberly Myers, English.

The Meritorious Technology/Science Award
Mark Jutila, Veterinary Molecular Biology.

President's Excellence in Teaching Award
Ferdinand Johns, architecture; Marvin Lansverk, English; and John Paxton, computer science.

Betty Coffey Award
Wendy Stock, economics.

John Simon Guggenheim Fellowship
Eric Hongisto, art.

STUDENT AWARDS

Barry M. Goldwater Scholarship
Bridgid Crowley of Helena, biochemistry.

Phi Kappa Phi
Katherine Anne Sparks of Plevna, agricultural business and Honors Program, received the national Phi Kappa Phi Graduate Fellowship.

Jack Kent Cooke graduate scholarship
Brian Brush of North Plains, Ore., architecture.

Foundation's Graduate Achievement Awards
Adrienne Ohler of Mount Pulaski, Ill., applied economics, received the Outstanding Graduate Achievement Award for a master's student.

Shane Doyle of Crow Agency, received the Outstanding Native American Graduate Achievement Award.

Fulbright graduate research grant
Anne Devereux of Pasadena, Calif, graduate student in MSU's Science and Natural History Filmmaking program.
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**GRAND TOTAL**                                             **$98,475,262**
INSIDE

Opportunities are brewing  Cold research is hot  Fraud Busting  Dinosaur relatives