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A common criticism heard when an institution of higher education begins to develop and strengthen its research programs is that such emphasis is counter to the traditional role of academics, which is teaching. Such sentiment is a myth; in its purest form, research is teaching.

Our society today is rapidly changing because of technological advancements. Many of these advances are a direct result of university research activities. Moreover, research provides state-of-the-art programming and opportunities through which students become ready to join and actively participate in the work force.

At The University of Montana, continued and increased participation in sponsored activity has greatly enhanced our existing research infrastructure and, as a result, our teaching ability. For example, as a result of participation in grant and contract activity, UM is able to upgrade existing equipment and purchase the latest up-to-date equipment for both classroom and research use, equipment that otherwise could not have been secured. Similarly, because of a National Science Foundation EPSCoR grant that provides partial support and start-up funding, UM is recruiting eight new faculty members who could not have been hired without these funds.

To reinforce the bond between research and teaching, a key component in furthering the research program at the University has been participation by the academic deans. Through their commitment and involvement in collaborative and strategic planning, areas of academic and research strength have been identified across campus and include exciting developments in biotechnology, health and environmental sciences, and forestry.

As a partner in the International Heart Institute of Montana, the University has developed a collaborative research relationship with St. Patrick Hospital and other local health care organizations. Additionally, we recently have initiated funded ventures into international education and outreach, as demonstrated by UM’s School of Education serving as the lead university on a U.S. Agency for International Development grant to train officials in Namibia, South Africa. A second project involves the Schools of Forestry and Education and will bring several million dollars to UM to develop a NASA-funded International Training Center for Earth Observing System data.

Working with the Missoula Area Economic Development Corp., the University has secured funding to create the Research Development Enterprise, which will include additional research space for University faculty, a business incubator wherein University research can be developed and grown, and a research park where businesses and entrepreneurial efforts can be built. Additional emphasis on technology transfer and the commercialization of University research and development play a significant role in the economic development of the state and region.

As you read this issue of Vision, I trust you will better understand and share in the enthusiasm of University research and scholarship and concur that this is, indeed, an exciting time to be part of The University of Montana.

T. Lloyd Chesnut
Vice President for Research and Development
SOAKING UP HISTORY

In 1938 a fish believed extinct for 400 million years—a coelacanth—was caught by South African fishermen. Thought to have disappeared with the dinosaurs, coelacanths are examples of what researchers call Lazarus taxa—plant or animal species that seem to leapfrog great intervals of geologic time.

Now UM geology Professor George Stanley Jr. may have discovered his own time-traveling species. While doing field research on Vancouver Island, British Columbia, Stanley unearthed fossils of prehistoric sponges.

What makes the tiny cap-shaped fossils remarkable is that Stanley found them in rocks of the Triassic period, a geologic epoch starting about 245 million years ago. Stanley's fossils are about 200 million years old, and previously the fossils had been found only in Australian rocks of the Cambrian period, which started about 570 million years ago.

Stanley says the time gap between the age of his discovery and the Australian finds is about 325 million years, making the sponges a prime example of Lazarus taxa.

Stanley tried for years to identify the fossils, and finally published a photo of them, prompting another researcher to tell him what they were.

Stanley says the sponge fossils lend credence to the theory that Vancouver Island formed far out in the Pacific Ocean and later was thrust against the coast of Canada by plate tectonics. Also, since the ancient sponges probably flourished in shallow water around volcanic islands, the sponges provide evidence that such places act as incubators that shelter life from mass extinctions.

Writing Satellite Software

If all goes according to plan, software designed by UM forestry Professor Steve Running will be launched into orbit this year. Since 1992 Running has used a $7.9 million NASA grant to create software for the Earth Observing Satellite, a $7 billion machine that will monitor forest ecosystems from space. Running's program, which will measure vegetation cover across the globe, can be used to predict the likelihood of forest fires, study drought conditions and chronic other global changes. The satellite will become a premier instrument for measuring global warming. Running wrote the software with a team of about a dozen UM faculty and graduate students. He says the satellite will bring major attention to UM after the launch, since he and his staff will train experts to interpret the data the satellite gathers. Running has worked with NASA since 1981, when the space agency decided to expand its scientific research team to include scientists such as ecologists.

Undergrads in Research

UM's Division of Biological Sciences was awarded a prestigious $1.4 million grant from the Maryland-based Howard Hughes Medical Institute in fall 1998. Assistant Professor Carol Brewer prepared the grant request and will direct the resulting project, which is designed to involve more undergraduate students in biological research.

The grant will be used to design a core biology curriculum that is more research oriented from the freshman to the senior level. A new internship program also will make stipends and small grants available for undergraduate research. In addition, the division will upgrade its teaching equipment and labs.

"This grant will make a significant impact on our program," Brewer says. "I'm so excited because this whole project is focused 100 percent on students. This will allow us to take a dynamic approach to our curriculum and get more undergraduates involved in research."

The institute awards the grants to universities to strengthen undergraduate biological science programs.
EXPLORING THE GLOBE

Across Montana and the nation, students in grades K-12 become field scientists through a project that helps scientists study Earth's environment. Last year UM became a national training site for NASA's Global Learning and Observations to Benefit the Environment, a worldwide network of students, teachers and scientists who work together to study and understand global conditions.

Science teachers from across Montana have participated in UM workshops to learn how to teach their students to measure temperatures and participation in soils. Students go into their schoolyards and do hands-on science that is relevant, studying the atmosphere, hydrology, the water cycle and the biology and geology of the Earth's surface.

GLOBE students report their data via the Internet to scientists, who use the information in their research.

TAKING SHAPE

Construction workers are pounding and sawing toward the completion of a $10.4 million addition to the Pharmacy/Psychology Building on the south side of campus. The addition will enable the School of Pharmacy and Allied Health Sciences to bring all its programs together for the first time.

Three campus buildings now house the school's two major undergraduate programs - pharmacy practice and physical therapy - and a graduate program in pharmaceutical sciences. The expansion will combine the school's departments with modern teaching laboratories and better accommodations for student and faculty research.

If all goes as planned, the research section of the expansion project could be ready for use during fall semester 1999. The rest will be completed in the year 2000.

The 1997 Montana Legislature appropriated $2 million for the expansion. The private Utah-based ALSAM Foundation contributed $5.7 million and American Stores Co. added another $2.5 million. The rest of the money came from faculty, alumni and friends.

TEACHING EDUCATORS

The University is leading a consortium of higher education institutions in providing graduate training for educational leaders in the African nation of Namibia.

CALCULATING RISKS

An innovative mathematics project created in part at UM recently was honored for its role in AIDS/HIV education.

UM math Professor Johnny Lott accepted the Governor's Award Dec. 1, 1998, on behalf of the Montana Council of Teachers of Mathematics.

"We approached it from a purely mathematical standpoint," Lott says of the project. "What we tried to do is let (students) reach their own conclusion that the best way of being safe is to avoid risky behavior."

The SIMMS Project, created with a grant from the National Science Foundation, earned the award for a chapter that used real AIDS and HIV statistics. The curriculum is being used by students across the country, including about 8,000 students at 75 high schools in Montana.

Other institutions participating in this three-year model program for delivery of international education include the University of Western Cape in South Africa, the University of Namibia, the University of Wisconsin and the Harvard Institute for International Development.

UM was selected by the U.S. Agency for International Development to provide the training with a $1.6 million contract.

SPAWNING DEVELOPMENT

Business, research and technology will come together through a new Research Development Enterprise under way at UM. Using a $500,000 federal appropriation secured by Montana Congressman Rick Hill, UM has begun planning and designing a research park to be built at an off-campus site in Missoula.

The project will provide a research development plaza for additional research and laboratory space for UM faculty and students. It also will include a relatively secure financial environment for spin-off companies to develop technologies and a research development park to house development firms, personal and professional services, light-manufacturing offices, and laboratories.

RDE, which will require a $4 million federal investment over the next several years, will generate more jobs for Montanans, Hill says.
ANATOMY OF A GRANT

Research grants funded an estimated $12.7 million in wages and benefits for UM students, staff and faculty members in 1998. Each million roughly translates into 25 full-time jobs. Thus a payroll of $12.7 million infuses the Montana economy with more than 317 jobs.

Sponsored research programs at UM can be compared to completely self-supporting small-business enterprises, forestry Professor Steve Running says. Running's Numerical Terradynamic Simulation Group is one of the top five competitive-grant recipients on campus, operating with an annual research budget of about $1.5 million, largely from NASA.

Other than Running's salary, the state pays none of the cost involved in the day-to-day operations of his lab.

Running's campus colleagues benefit from his grant as well. As new computer technology is acquired and integrated, older equipment is passed to other programs in the School of Forestry.

Of the $1.5 million, $300,000 is paid to the University as rent for research space. The balance of Running's grants pay salaries, health benefits and retirement packages for 12 employees, including an office/grant manager, two software engineers, three postdoctoral research associates, and three or four doctoral students; office expenses such as telephone bills, postage, basic supplies and equipment purchased from local suppliers; travel to meetings and conferences; and basic research and development expenses.

The University's other top research grant recipients are Jerry Bromenshenk, who uses bees to detect environmental hazards and pollutants; Robert Hausmann, who places English teachers in eastern European nations; Tom Seekins of the Rural Institute on Disabilities, which provides support for Montanans with disabilities and their families; and the Montana World Trade Center, which connects Montana businesses with global markets for products and services (see related story on page 12).

Sources of 1998 Research Grants and Contracts

- Federal
- State & Local
- Private

Breakout of 1998 Expenditures

- Operating Expenditures: 44%
- Capital Expenditures: 15%
- Salaries, Wages and Benefits: 80%

MOVING FORWARD

In 1989 UM received a total of $8.7 million in grants. A forward-thinking Montana Legislature that year encouraged investment in university research by allowing institutions to retain their indirect-cost dollars.

This investment triggered significant return, as demonstrated by the 98-percent increase in grant volume UM experienced just five years later in 1993.

Today, UM's grant volume of $26.5 million represents a 294-percent increase over 1989's total.

UM President George Dennison has challenged research faculty members to reach $35 million in funded research by the year 2000.
Montana’s Flathead Lake has retained a clean reputation in times of deteriorating water quality around the world. Yet the lake’s water quality is not immune to decline. In fact, its water quality has worsened in recent years, according to scientists who continually monitor the lake.

“At the turn of the century and up until 30 years ago, when I started my scientific career on Flathead Lake, water quality was about two times better than it is today,” says Jack Stanford, an ecosystem scientist.

For years clean-water advocates and lake managers have waged a battle to prevent Flathead Lake — the largest natural freshwater lake west of the Mississippi River — from becoming irreversibly contaminated. Individuals, citizen groups and governmental bodies from local, county, state, tribal and federal levels have joined forces in the effort. Behind the scenes stands a scientific research facility whose investigators are dedicated to delivering the scientific facts necessary to make informed decisions about the lake.

Stanford, the director and Bierman Professor of Ecology at The University of Montana’s Flathead Lake Biological Station, heads a team of researchers who have studied the lake’s water quality for years. In fact, Flathead owes its reputation as a healthy lake largely to studies at the biological station at Yellow Bay, located on the lake’s east shore.

Although most of the station’s course offerings and research deal with the biological and chemical properties of Flathead Lake, the station’s annual monitoring program specifically targets the lake’s health. Monitoring data gathered by station scientists inform the public and those with the power to decide what does and does not happen to Flathead Lake.

“People come to us for the basic information,” Stanford says. “We just let the people know what the situation is.”

Scientists gather samples from Flathead Lake about 15 times each year at the mouths of inflowing tributaries, at the lake outlet and from various other sites around the lake. Using state-of-the-art equipment, researchers look for concentrations of such things as zooplankton, phytoplankton and algae. These data, which reflect the health of the lake, are analyzed and compiled into a limnological chronology.

This chronology was begun at the biological station more than two decades ago and reveals a long-term trend of deteriorating water quality. Telltale signs of the lake’s failing health were two offshore blooms of blue-green algae — in 1983 and 1993.

“Clean, healthful lakes are consistently transparent, are free of scum-forming algae and contain a stable food web, including a diverse array of native plants and animals,” Stanford says. “Such lakes are said to have high water quality.”

Data analyses are supplied to the Flathead Basin Commission, whose mission is to monitor and protect the basin’s water quality. Managerial authorities can use the information to make informed choices about the lake environment.

Such relaying of monitoring data to the public and managerial...
Scientists from the Flathead Lake Biological Station sample river biota from the Middle Fork of the Flathead River.

authorities has benefited the lake. In fact, when the biological station's monitoring program was just getting off the ground, the information it gathered fostered a movement to improve sewage treatment plants in the Flathead area. A four-year river-basin study begun in 1977, with funds from the U.S. Environmental Protection Agency, showed that urban sewage treatment plants in the area were causing about 17 percent of the nutrient pollution — nitrogen and phosphorus — around Flathead Lake. The first bloom of toxin-producing blue-green algae in 1983 supported the finding.

In an effort to help solve the pollution problem, the biological station built an experimental sewage treatment plant to demonstrate the feasibility of nutrient removal. After that, the Montana Water Quality Bureau initiated a program to reduce nutrient inputs from urban areas.

"The program banned local sale of phosphorus-containing detergents and provided for reconstruction of urban STPs (sewage treatment plants) for nutrient removal," Stanford says.

The EPA worked with the cities of Bigfork, Columbia Falls, Kalispell and Whitefish to modernize and upgrade their sewage treatment plants after the river-basin study. The biological station continued to monitor the lake for nutrient pollution from urban areas. And according to a 1997 report by the station, improvements to sewage treatment plants over the previous 10 years reduced pollution reaching the lake by 15 percent.

"If we hadn't been here, I think Flathead Lake would be a mess today," Stanford says.

In their research over the past 20 years, Stanford and his colleagues have learned much about Flathead Lake. They attribute its deteriorating water quality to three factors: pollution from human sources, regulation of water level and flow by Hungry Horse and Kerr dams and the introduction of non-native flora and fauna. Inputs from human sources elevate the level of nutrients in the lake, the dams cause shoreline erosion and decrease the fertility of the lake, and the introduction of non-native species alters the lake's food web.

Stanford says a disruption in the food web may have been the main cause of the 1993 algae bloom on Flathead Lake, since the nutrient input from human sources had been greatly curtailed in the 1980s by upgrading the sewage treatment plants.

"There is little doubt that the 1993 bloom would have been much worse if the treatment plants had not been upgraded," Stanford says. "However, the relationship between nutrient inputs and algae blooms was vastly complicated by the invasion of opossum shrimp, which destabilized the food web."

The opossum shrimp, or *Mysis relicta*, colonized Flathead Lake after being introduced into Whitefish and Swan lakes. Researchers at the station predicted an alteration in Flathead Lake's
food web after the shrimp were discovered in the lake. The shrimp, whose main food is zooplankton, would flourish. The population of kokanee salmon, which also forage primarily on zooplankton, would decline dramatically from lack of food. As native salmon populations declined, non-native species such as lake trout and lake whitefish, which eat primarily opossum shrimp, would flourish because of their abundant food source. True to the researchers’ prediction, the food web changed: Mysis shrimp and lake trout, two non-native species, now dominate the lake’s food web. “By 1988 the kokanee were gone, and the lake was full of mysids, lake trout and lake whitefish,” Stanford says. “Adding insult to injury, this food-web change contributed to the continuing decline of water quality because large zooplankton, which eat algae, were vastly reduced by the shrimp.”

Shrimp numbers are up again, according to the station’s investigations. Stanford presumes the lake trout and lake whitefish have outgrown the shrimp prey and have begun eating baby bull trout — listed under the Federal Endangered Species Act — as the bull trout enter the lake from the river system. Lake managers now have a dilemma about how to respond. Stanford suggests further scientific study by the station before any managerial decisions are made. “I believe that more needs to be known about how the food web works before we invest huge sums of money in lake-trout control,” he says. “We must reasonably forecast the consequences, not only for the lake fisheries, but also for water quality.”

“Research at the biological station will continue to focus on the lake as the crown jewel of a vast mountain ecosystem …”
Students from the biological station gather samples of lake biota from Yellow Bay. The station grounds can be seen in the background.

Despite success stories such as the advancement of area sewage treatment plants, the station’s monitoring work is never done. The lake ecosystem changes continually.

But the monitoring program now is threatened by a lack of funding. The $80,000 a year it costs must come from local and state sources, not from the station’s research funding. In the past, the Confederated Salish and Kootenai Tribes and Flathead and

Lake counties partially funded the yearly monitoring, but these sources and others have dried up. Currently the Department of Environmental Quality and Montana Power Co. supply half the need, and the station’s endowed professorship subsidizes the budget shortfall. But Stanford says the endowed professorship cannot permanently support the program.

Losing the ability to monitor Flathead Lake frightens Stanford. He says the monitoring program must stay afloat for the good of the lake. Without monitoring, water quality in the Flathead ecosystem will be compromised, with results that could affect quality of life.

Stanford and his colleagues continue to monitor Flathead Lake with hope that funding will come through. They also continue their limnological studies in the Flathead region. But the lake is their focus.

“Research at the biological station will continue to focus on the lake as the crown jewel of a vast mountain ecosystem characterized by wonderful natural attributes,” Stanford says. “Our economy, our quality of life and our future are tied to conservation of high-quality water in Flathead Lake.”

**STATION TURNS 100**

UM's Flathead Lake Biological Station began testing Flathead Lake water quality with its annual monitoring program in 1977, but the station has been concerned with Flathead's ecosystem for much longer than 22 years. In fact, Morton J. Elrod, the first director, established the biological station in 1899 at the mouth of the Swan River. That site north of Yellow Bay was a place of scientific study and teaching until 1912, when the station moved to its present location.

For most of its history, the biological station was a summer institution. Not until 1977 and the river-basin study did the station become a year-round research facility.

Since the beginning, the biological station has been dedicated to teaching field courses. As years passed, research also became a significant priority. But service to the community, whether through public lectures or special classes, has always been a component of the station’s mission.

Today the biological station staff works year-round toward four goals: conduct and publish basic research in ecology, with an emphasis on the Flathead River/Lake ecosystem; provide quality college courses in field-oriented ecological disciplines; train graduate students in ecology; and provide information to the public on ecological issues.
During the last week of classes before Thanksgiving, in a dance studio of the Performing Arts and Radio/Television Center, a dance class becomes a room full of turkeys. Karen Kaufmann, UM visiting dance instructor, has just directed her students to move like the big, generous birds. Men and women ranging in age from 18 to 50 now create a spectrum of motion as varied as their attire, which runs from leotards to jeans, sweats to suits, a red kerchief bound around a head. With broad, percussive swings of the arms, some cradle invisible bounties while others sway their hands, march in place, slide, spin and, of course, waddle. The dancers perform a rich and surprising matrix of movement.

The class is called Teaching Dance for the Disabled, a program developed by Kaufmann in 1992 as a way of training UM dance students in teaching skills. Offered each fall, the class welcomes 20 participants — some are developmentally disabled, some suffer from cerebral palsy, some have been in debilitating accidents. Outside the classroom, these people struggle to navigate a world that does not make much room for disability. What they share here in the immense studio is movement.

Many dance alone. Hands rise in all fashions, out to the sides, high in the air, arcing in circles overhead, stretching skyward, fingers twitching. A man in a wheelchair named Lee waves his hands back and forth. Becka, a tall, vision-impaired woman, steps away from the group and dances in small circles the length of the studio. Barbara marches in groovy triumph beside the accompanist, bowing repeatedly to the young man after each piece. Dick, arms raised, likes the feeling of leaving his body, becoming “a tree, a bird or a goose.” Kaufmann is pleased.

The point of the class, she says, watching students lose themselves in dance, is that they learn “not what’s right in movement, but their own.

“Just about everybody can move in some way,” Kaufmann says. “I
think people learn a lot about themselves through movement. They express themselves through movement and learn about the world, who they are, how they feel.”

Having studied undergraduate dance at Hampshire College in Amherst, Mass., Kaufmann came to UM in the late 1970s, leaving briefly to pursue graduate studies at Antioch College in Ohio. Since then, Kaufmann, with colleague Amy Ragsdale, co-founded and now co-directs the Montana Transport Company (Mo-Trans), UM’s professional dance troupe.

Kaufmann’s passion for bringing dance to a variety of populations led her in the 1980s to Missoula public schools, where she taught a number of special education classes. There she faced a “creative challenge to find ways a student can adapt and change and vary.” This challenge inspired her to teach her University students how to introduce creative movement to diverse populations.

A partnership with Very Special Arts Montana, which enrolls students with disabilities and provides transportation, Teaching Dance for the Disabled is a required course for UM dance students who want to teach. But Kaufmann also gets calls from all over campus—from wildlife biologists, for example—who wonder if this is something they can do. “And it always is,” she says. “Anybody can walk in, having never had a dance class or having had years (of classes).”

In June 1997, professionalism both in teaching and performance came together in A Step Forward. Presented on PBS, the short documentary made by KUFM’s Gus Chambers follows students through classes and into rehearsals, culminating in a public performance for a full house at Missoula’s Front Street Theatre.

These days, Kaufmann divides her time between teaching classes and overseeing the teaching track, which educates dancers to work with several nontraditional dance populations, such as children, UM beginners and the developmentally disabled.

Kaufmann says, “It’s another important part of my work—to get dance to as many different populations as I can, to get more educators to realize the value of movement in the classroom as a learning tool.

“The key is in adapting dance to whatever population you have,” she says. “Rather than expecting students to be at the level I want, it’s up to me to use the language I know along with what they know and turn it into (performance). It became clear that if I used my creativity, perceiving both consciously and unconsciously, subtly and instinctively, what they can do and how I could progress them, I could actually make something happen that nobody thought could happen, not that person, not me, not the general population.”

Just as Kaufmann and her student instructors cultivate dance in students with disabilities, they also learn new ways of dancing themselves. Delphine Rose, a senior who has taken the class twice, finds this work inspiring. “I love being a dancer, having seen these beautiful people dance,” she says. “Professional dancers spend so much time on technique and getting things perfect. Because the students with disabilities don’t have the full function of their bodies, they find other ways to create a movement. For people like me, who’ve been conditioned to move in a certain way, it’s a real eye-opener. I think, ‘Oh, I can move this way.’ They just really dance with their hearts.”

“They embody something unaffected,” Kaufmann says of these students. “There’s an openness, an honesty with themselves about where they’re at, what they can do, and if something triggers their imagination or their creativity, they’re very spontaneous.”

As an end-of-class exercise, Kaufmann suggests that the dancers demonstrate a shape with their bodies, first a straight line, then a circle, finally a spiral. She hands out colored streamers, and the students cross the studio, dipping at the knees, whirling their arms, twirling the orange, purple and green fabric. Someone calls out that she feels like a roller coaster, and Kaufmann agrees. “A whole room full of roller coasters,” she says, joining in the parade-like gaiety. Everyone is flushed and grinning.

“This class improves flexibility, coordination and balance,” Kaufmann says. “But there’s also the creative benefit of the students seeing themselves as having imagination.”

Kaufmann looks out over the room, regarding the roller coasters. “In a way, teaching this class has made me understand movement better because it brings (dance) back to a very basic level. Some dancers think so much in terms of complex patterns. There’s so much beauty in simplicity.”
From Montana to the World

UM Helps State Companies Find International Markets

By Caroline Lupfer Kurtz

It takes four hours in a twin-engine plane to get from Missoula to Culbertson, a dot on the prairie between the Fort Peck Indian Reservation and the North Dakota border. Culbertson is the home of Montola Growers Inc., a not quite two-year-old safflower oil processing facility.

The company buys seed from area farmers and produces food-grade oil in bulk quantities, employing at times up to 40 people, depending on orders. It’s a good business that aims to do much more and will — with the help of the Montana World Trade Center at UM.

“Marketing is everything in the business world in Montana,” MGI general manager Neil Turnbull says. “The more help we get, the better off we’ll be.”

Turnbull knows that his company needs to explore every possible use of safflower oil in order to compete and grow. He would like to begin exporting his product — for instance to Japan, where safflower oil is extensively used. To do so he will have to make it in forms they want.

All Montana companies should be looking at ways to add value to their products for overseas markets, says Arnold Sherman, director of the MWTC — even the traditional agriculture and timber industries.

“Given American leadership in management, marketing and creativity,” he says, “we should not be competing at the basic level overseas but at the value-added level.”

The Montana World Trade Center was founded in 1995 to help Montana companies establish or strengthen their international commercial capabilities and improve the state’s export ranking. Based in UM’s Gallagher Building, the MWTC can provide direct technical expertise to any company at any stage of development with an appetite for taking products to the global marketplace, Sherman says.

Currently the trade center works in an advisory capacity with about 50 companies. Hundreds more have taken advantage of center-sponsored conferences, seminars and international trade missions. MWTC staff also can provide Montana businesses with representation at important trade shows for a fraction of the price companies would pay to enter on their own.

“But the real difference between the MWTC and an industry or trade organization,” Sherman says, “is our ability to create business opportunities and land deals, not just promote products.”

Last August, Sherman, Sen. Max Baucus and Peter Blouke from the state Department of Commerce accompanied 16 Montana businesspeople on a 10-day trade mission to Argentina, Chile, Uruguay and Brazil. According to Sherman, emerging markets in Latin America, Russia, Central Europe and Southeast Asia represent the United States’ most important future trade partners, more so than Japan and Europe combined. MWTC planners scheduled daily meetings for participants with private
businesses and government agencies expressly interested in their products, and organized individual briefings with representatives from the Inter-American Development Bank and U.S. embassies. This was all for $5,000 — the price of a single ad in some trade publications.

“It was the busiest time of my life outside the military,” says Lillis Manshadow Waylette, president of Mountain Chief Corp. in Missoula and a member of the Confederated Salish and Kootenai Tribes. Waylette praised the organizational skill and personal commitment of the MWTC in putting the mission together.

“It was a very effective way to do business,” says Phyllis Egan, a former nurse and president of ITS Inc. in Butte, which provides advice and training on medical systems and imaging technology to rural hospitals. Her company also produces and markets Protect-U-Pac™, a safety kit that includes gloves, face mask and disposable bag for anyone giving aid at an accident site.

Egan says it might be some time before any South American leads pay off for her business, but she nevertheless made contacts that would have taken years to acquire on her own. Being part of the trade mission also enhanced interactions among the businesspeople who went, she says.

“We’re now on the lookout for opportunities for each other and for potential collaborations.”

Even with his decades of experience in marketing and finance at IBM and his own management consulting firm, Waylette says he never would have known about the commercial opportunities offered through the development bank and the U.S. Agency for International Development if not for the trade center.

Waylette’s firm, Mountain Chief Corp., offers training and planning assistance in all areas of business operations. The company also provides certification of authenticity for American Indian goods and helps market these products to high-end outlets such as boutiques, duty-free shops and cruise ships.

As a result of last summer’s trade mission, Waylette is working on proposals to the Inter-American Development Bank to provide advice on retirement planning and medical services delivery and technology to some Latin American governments. He works closely with Whitney Belker, the MWTC field representative in Buenos Aires, Argentina. Belker’s experience in Latin America and with the development bank makes her knowledgeable about the technical and political feasibility of potential business opportunities for Montana companies.

Environmental services are one particular area of opportunity Sherman sees for Montana businesses worldwide. The Montana World Trade Center is the only one based at a university, Sherman says. Because of this, Montana businesses have access to the services of a global trade center network and the expertise and resources of the University System.

The bottom line, says Sherman, is that the trade center exists to help Montana businesses become more competitive and cost effective in the world marketplace.

“You can be anywhere now and have a competitive business with the Internet,” he says. “People buy because of the perceived value of a product, not because of geographic location. We want to educate individual companies and the broader economic community about new technologies so that the thought of entering the global market is not such a daunting goal. You don’t have to open an office abroad to be international.”

American Development Bank and others fund many environmental reclamation and large infrastructure construction projects every year in foreign countries — $7 billion worth in Latin America alone. Montana has experience in these areas, Sherman says, but has never provided a vendor for any IDB project.

To remedy this, the Montana Environmental Consortium was formed. The consortium unites the skills and resources of environmental companies with the technical research and marketing expertise, language translation abilities, and financial aid and political support of the MWTC and the Montana University System. Sherman says about 24 of the 80 or so environmental firms in the state have joined the consortium. By pooling their abilities they will be able to compete successfully for international contracts in mining-pollution prevention and remediation, sustainable resource development, environmental engineering and construction, tourism development, and environmental assessment and management. The trade center will search out projects, evaluate the requirements, identify which firms would be best suited to participate and administer the contract if the project is awarded.

“There’s a lot of talent in Montana that could do excellent work overseas,” says John Morrison Jr. of Morrison-Maierle, an engineering consulting firm with offices in Helena, Billings, Bozeman, Great Falls and Kalispell. “There are opportunities, but you need organizations like the trade center to continue to promote the cause.”

Of the 327 world trade centers in 97 countries around the world, the Montana World Trade Center is the only one based at a university, Sherman says. Because of this, Montana businesses have access to the services of a global trade center network and the expertise and resources of the University System.

“Marketing is everything in the business world in Montana.”

Lillis Manshadow Waylette, Mountain Chief Corp.
by Caroline Lupfer Kurtz

ome people think the AIDS crisis is over. It isn’t for Terry Mailloux of Missoula. Two of his best friends are dead because of HIV, the virus that causes AIDS. One was infected through blood-clotting factor to treat his hemophilia. The other contracted HIV probably as the result of sex with an infected woman 10 years ago. His illness went undetected until last summer, when he developed pneumonia and died within a month. No one knew his immune system had been silently destroyed and that his body harbored a deadly legion. Because of that, two other women now carry the virus.

AIDS has not disappeared for Dr. Raymond Geyer or David Herrera either. As one of the few infectious disease specialists in Montana, Geyer provides primary care to people with HIV/AIDS in the Great Falls area. He is about the only physician in town who does. Meanwhile, from offices in Billings, Herrera and a network of outreach workers across the state offer AIDS prevention workshops and support for those most at risk of contracting HIV.

“People still need to know it’s out there and to protect themselves,” Herrera says.

About 400 AIDS cases have been reported in Montana since 1985. At least 26 new cases were identified in 1998. Although AIDS deaths are down for now — thanks to anti-retroviral drugs — virus transmission is steadily increasing. More people are living longer with AIDS, but most cannot continue to afford drug treatments, which cost around $16,000 per person per year. And many people who have been sick for a while are growing resistant to therapy.

It should be clear by now, health care workers say, that although HIV is difficult to get, it does not discriminate on the basis of race, creed or sexual orientation. As Mailloux, Geyer and Herrera know, for people whose lives have been affected by the...
HIV Vaccine Front

There are no happy endings. The only real hope for stemming the worldwide tide of HIV infection is a vaccine, which so far has proved stubbornly elusive.

At a recent meeting of the Governor's AIDS Advisory Council in Helena, however, members Geyer and Herrera were cheered to hear some good news reported by Jack Nunberg, biological sciences professor and head of the Montana Biotechnology Center at UM.

In an imaginative leap propelled by scientific theory, intuition and luck, Nunberg and his HIV research team succeeded in creating the first prototype vaccine that can induce antibodies - in mice, at least - capable of neutralizing a broad spectrum of HIV strains grown from the blood of infected individuals from around the world.

The vaccine's success hinges on capturing the virus's outer protein envelope and certain cell-surface receptors in the midst of their intricate dance of binding and fusion. Such "fusion-competent" immunogens apparently more closely mimic the conditions of active infection. Nunberg's lab has elicited an antibody response that blocked cell infection by 23 of 24 genetically diverse HIV types found in the United States, Europe, Africa, India and Thailand.

Other vaccine approaches have been based on nonfunctioning HIV protein envelope subunits. While these produced some promising results against laboratory strains of HIV, so-called T-cell line adapted virus, such vaccines had no effect on virus obtained from infected individuals, Nunberg says.

Nunberg, former doctoral student Rachel LaCasse, postdoctoral fellow Meg Trahey, senior research associate Kathy Follis, and colleagues at New York University report their findings in the Jan. 15, 1999, issue of the journal Science.

Their work recently was singled out by Dr. Robert Gallo, a founding father of HIV research, as some of the most important news on HIV vaccines since the field began.

Nunberg received early support for his novel vaccine approach from the privately funded American Foundation for AIDS Research (AmFAR). Recently the National Institutes of Health awarded him two grants to continue fusion-competent vaccine research, for which the University has filed a patent application - one grant for $420,000 over two years and another for $1 million is anticipated.

NIH trials of the experimental vaccine using Rhesus monkeys are planned for sometime in 1999. And the pharmaceutical company Merck & Co. Inc. has expressed an interest in conducting its own tests. In addition, Nunberg is working with researchers at Therion Biologics Corp. in Cambridge, Mass., to prepare a genetically engineered vaccinia virus to deliver the fusion-competent vaccine. Such a vehicle - similar to the type used in the smallpox vaccine - would be more likely to move into human trials than would the current whole-cell approach.

The failure of earlier vaccine strategies to mount a defense against primary isolate virus, coupled with the discovery of co-receptor molecules for virus-cell binding and entry, opened the way for the fusion-competent vaccine idea. Researchers have long known that the T-cell receptor molecule CD4 is a key element for binding, but CD4 alone is not sufficient for viral entry into a cell. In 1996 several co-receptors were identified that mediate the complete fusion process.

"We know that HIV-infected people show some neutralizing ability, but the vaccine trials didn't result in any antibodies capable of neutralizing primary isolate virus," says Trahey, biochemist and Nunberg's wife. "The difference was that people have active infection going on, so it seemed reasonable that there is something about the process of virus-cell binding and fusion that is crucial for the body to mount a defense."

Scott Larson, a senior in medical technology and microbiology, removes the virus from cold storage in liquid nitrogen.
Nunberg believes that somewhere in the cell-virus surface interactions HIV is vulnerable to antibody attack. “If we can mimic these surface interactions,” he says, “using fusion-competent vaccines that catch the molecular machinery in midstep, then perhaps we can engender the type of neutralizing antibody seen in active infection.”

The researchers’ success at picking just the right moment and method to stop the molecular process and have the vaccine produce an effect was “really amazing,” says Trahey, whose work is to isolate the specific biochemical steps in the binding and entry process and identify which proteins are involved at what stage.

Follis and LaCasse did much of the work involved in making the vaccine and using it to inoculate mice genetically engineered by NYU colleague Dan Littman to express human CD4 and co-receptors. Blood samples from the vaccinated mice yielded antibody-containing serum, which was tested against various HIV strains to see whether antibodies would bind to the virus and block it from entering cells.

Given the genetic variability of HIV, these findings suggest that the antibodies are acting against something that is common to most virus binding and entry.

Worldwide the number of people infected with HIV has grown to more than 33 million, 10 percent more than one year ago, according to United Nations and World Health Organization estimates. The virus killed 2.5 million people in 1998 alone. In some countries in southern Africa, fully one-quarter of people between ages 15 and 50 have died or are dying from AIDS. Babies are born infected, and more children are orphaned every day. Ninety-five percent of all infected people live in developing countries, making an affordable vaccine the only way to stem the epidemic.

“As with other infectious diseases, we want to be able to protect against infection rather than treat after the fact,” Nunberg says. “Vaccination campaigns have worked to eliminate many infectious diseases.”

Fusion-competent vaccines are the best news so far in the campaign against HIV. However, AIDS educator Herrera cautions: “A vaccine is not a cure. We will still have infected people who need care and treatment. The risk of HIV will still be out there, and people need to continue to protect themselves and not revert to unsafe practices.”
Somer Hileman, a UM junior, is a paid America Reads tutor for students at Missoula’s Lowell Elementary School.

Montana Takes Time to Read

By Joyce Bruslin

Remember learning to read? Our memories of kindergarten probably don’t include learning the proper way to hold a book, or learning to read from left to right and from top to bottom. Instead we might remember the stories those books contained or the drawings that illustrated them. Most of all, we might remember the person who held us and read to us or the person who patiently listened to us read aloud.

UM is in its second year of bringing these types of one-on-one reading experiences to elementary schoolchildren in Missoula. When President Clinton issued his America Reads Challenge in 1997 — that every schoolchild in America read well and independently by third grade — he accompanied his directive with $210 million to fund literacy programs for children. Included were funds to pay the wages of college students who would go into local elementary classrooms to help meet his challenge.

UM faculty members in the School of Education have worked with Andrea Vernon, director of Volunteer Action Services at UM, to place 15 University students as paid tutors in kindergarten and first- and second-grade classrooms at three Missoula elementary schools. Twenty-six volunteers, including other college students and retired senior citizens, regularly visit other Missoula-area elementary schools. All of the tutors understand their purpose from the beginning.

“There is a need for reading to occur much sooner than it does,” says Rhea Ashmore, UM curriculum and instruction professor. “For that to happen students need more exposure to reading.”

Tutors in the America Reads program provide that exposure in three important ways, explains Marian McKenna, UM associate professor of curriculum and instruction. “They are adults in a nonauthoritative role who can model reading by reading themselves and by being seen carrying their own books around,” she says. “They provide one-on-one attention to children who might come from homes where parents have neither the inclination nor the wherewithal to read aloud to them or to listen to them read aloud. Finally, these tutors set
We read a huge variety of things. We are not there to teach children to read, but to support children in their efforts to read."

Somer Hileman, a junior majoring in art, is in her second year of work as a paid America Reads tutor. She works with students in kindergarten through second grade at Lowell Elementary School. "Last year I had a little girl who didn't know her letters when we started," Hileman says. "This year when I started, she came up and read a story to me on her own."

When Hileman's students read aloud to her, she helps them along by asking questions at key points in the story. "We try to get them involved with what they're reading to us," she explains. "We read a huge variety of things. In kindergarten we read things that have a rhythm to them and a pattern that the students can recognize and memorize." By first grade, illustrations are important, and Hileman guides her students in pronouncing unfamiliar words. "By second grade," she says, "we're reading short stories." Hileman liked her job so much the first year that she recommended it to her friends. This year two of them joined the program - one as a volunteer and the other as a paid tutor.

Before tutors begin work for the year, they attend training sessions conducted by literacy specialists from the School of Education faculty. "We teach them how to read to and with youngsters and to read with expression and intonation," Ashmore says. Tutors also learn strategies for coping with and strengthening any weak areas they might find in their students' reading skills.

The training doesn't end there. During the school year, tutors attend two round-table discussions where they receive feedback and guidance from UM literacy faculty. "These tutors deserve support from our faculty," McKenna says. "The round-table discussions enhance their commitment."

Teachers and elementary school principals who will be active in the program are invited to a session at the beginning of the year. There Ashmore and her colleagues explain the role tutors will play in the classroom. "They learn what tutors can be expected to do and what they shouldn't do," Ashmore says. "They also learn what their own roles in the program will be."

Kathleen Cain teaches first and second grade at Lowell School and is using America Reads tutors in her classroom for the second year. "The tutors we've used have patience and have taken the time to establish good rapport with the students," she says. "The students really look forward to them coming."

Grace Onstad teaches kindergarten at Lowell and also is in her second year with the program. "The best thing about it is that it increases what we call 'book time' for the students," she says. "As the tutors read to them, the students learn how to hold a book and how to find the book title and the author's name. The extra time reading, talking about books and listening to stories increases the students' vocabulary. The students become very fond of the tutors and look forward to their reading time."

The collaboration needed for the success of America Reads has benefits outside of the classroom as well. "It melts down some town-to-gown barriers," McKenna says. "It cements seamless and effortless partnerships. Nobody owns this program."

UM's commitment to meeting the America Reads Challenge is strengthened by President George Dennison's service as one of 21 U.S. college and university presidents on the America Reads College Presidents' Steering Committee. "The America Reads Challenge strikes me as one of those initiatives naturally suited to colleges and universities," Dennison says. "I found nothing but enthusiastic support when the possibility of collaboration emerged, a cooperative endeavor that brings us together to ensure a better future for our children."

UM faculty members and the Montana Office of Public Instruction last spring received a one-time grant of $50,000 from the U.S. Department of Education to continue efforts in improving children's literacy statewide. Efforts in public schools dovetail with other America Reads activities in libraries, churches and even pediatricians' offices, where doctors participate by advising parents on literacy and giving away free books to children as part of their checkups.

When Onstad talks to parents about America Reads, she often finds that her kindergarten students have beaten her to it. They haven't gone home and described the methods, however. It's the person who interests them. "Many times parents just know there's somebody named Somer who comes to class to read," she says.

"The America Reads Challenge strikes me as one of those initiatives naturally suited to colleges and universities."
Magic Sand
Composites Mop up Metals Better, Faster

By Caroline Lupfer Kurtz

Chem lab has been moved out of doors, with positive results for the environment and industry. Along Belt Creek in the abandoned coal mine area northeast of Great Falls, UM graduate students Robert Fischer and Dana Hagers and postdoctoral fellow Susan Beatty spent last summer testing a method for cleaning up contaminated water for the state Department of Environmental Quality.

The pilot project, a homemade, portable "pump and treat" apparatus, flushed water from excavated sites through plastic columns filled with specially coated silica particles. This "magic sand" was able to mop up excessive amounts of iron and aluminum in the wastewater before it drained into the creek. In the presence of sunlight, air and the highly acidic environment of the creek itself, these metals had been seriously harming the ecology downstream.

The students' results "really impressed the DEQ," says Edward Rosenberg, chemistry professor and department chair. "The treatment remedied the acidity of the water as well as taking out the metals."

The next step, he says, will be to find a partner to help engineer the apparatus for larger-scale testing.

The key element of the experiment is the specially crafted silica-polymer composites — the magic sand — developed by Rosenberg and former UM chemist David Pang, who now conducts research at the University-affiliated International Heart Institute of Montana in Missoula. The pair received a patent for their system in 1997.

"We took previously known components and put them together in a unique way that gives the material special properties," Rosenberg says.

The resulting composites have several advantages over other types of materials, such as ion-exchange resins, currently used in many metal cleanup processes:

- They do not replace metals with unwanted ions in the water, they remove metals at a faster rate than resins and they are more durable.
- They also are highly versatile and can be designed to capture a wide range of target metals.

The composites are made by coating tiny porous particles of silica with organic polymers that electrically attract and bind charged metal atoms, thereby concentrating and separating them out of a solution. Different metals have different affinities for different polymers. How tightly a metal binds to a polymer determines its rate of migration along a column of composite, where it is trapped. In some instances, economically important metals can be rinsed off the composites and recycled, and the composite can be reused. In others, composites immobilize highly toxic metals, such as mercury or lead, into a solid matrix for safe disposal.

Polymers can be modified chemically to increase metal specificity and extraction efficiency. And recent work by Rosenberg's lab also has shown these materials retain their efficiency at high temperatures.

Designer composites can be created to remove a variety of toxic metals, such as mercury, cadmium and chromium. "Now that we have the process to make the material, we can let our imaginations run wild," Rosenberg says. "There are possibilities for all kinds of chemical cleanup, even perhaps of radioactive waste."

Rosenberg's group has conducted trials of their separation technique at the Berkeley Pit in Butte. Several hundred parts per million of dissolved copper, manganese and zinc languish in some 28 billion gallons of toxic wastewater there, which potentially
could be extracted for profit, Rosenberg believes. Results from the
lab-scale tests in 1996 showed that under certain conditions the
silica composites were highly efficient at concentrating and sepa­
rating the commercially valuable metals.

Rosenberg also is enthusiastic about potential applications for
the composites in industry, particularly in the copper-based manu­
facture of computer components. In
one demonstration, the composites
allowed 100 percent recycling by
capturing all the residual copper
from a particular plating process.
And the Calgon company, in
Florida, has been conducting tests
of the composites in copper-refining
in general.

The composites' major selling
points, Rosenberg says, are their
longevity and versatility, allowing
multiple tasks to be accomplished at
one site using one material. But to
be commercially useful they must be available in quantity.

For their part, Rosenberg and his students are more interested
in solving basic questions — such as the optimal particle size for
specific applications — and doing the chemistry to make compos­
ites more selective.

Purity Systems Inc., a Missoula-based company owned by
investors George Torp and Philip Barney, is working to produce
the composites commercially.

While Rosenberg and his team are busy working on ways to
improve the technology, “We already think it's a very sound
applied research program that we hope will yield benefits for the
state and for society in general,” he says.

Now that they've seen some of the results of their creation,
the group is working to understand more about the basic struc­
ture of the silica-polymer composites.

As Rosenberg says, “You can make something that works but
you have only a crude idea why it does. That's chemistry for you.”
UM Researchers Unravel Mysteries of Lyme Disease

By Cary Shimek

Peering into a microscope at his UM lab, molecular biologist Scott Samuels is able to penetrate the veils separating his world from a tiny, mysterious realm of wriggling, corkscrew-shaped bacteria. As long as the bacteria can be seen dancing individually or occasionally clumping into little globular clusters, he knows they are healthy and doing well.

Samuels, an assistant professor in the Division of Biological Sciences, has huge vats of the little guys — Borrelia burgdorferi — growing in his lab. However, they normally live inside ticks and other animals. Even humans.

Borrelia burgdorferi bacteria are the causative agent of Lyme disease, a tick-borne malady that can cause arthritis, nervous system problems, fever, fatigue and — in rare cases — death in people. The disease was first recognized in the United States after a mysterious outbreak of arthritis in 1975 near Lyme, Conn. More than 16,000 cases of Lyme disease were reported to the U.S. Centers for Disease Control and Prevention in 1996.

Samuels' microscope allows him to see the exteriors of the little wiggling worms, but researchers in his lab also are delving inside the bacteria, trying to understand how Borrelia replicates its DNA and how the organism's genes express themselves differently in radically different environments. How, for instance, can the organism survive in both ticks and humans? Samuels hopes the answers to these questions may lead to new or improved cures for Lyme disease.

Samuels set up his UM lab in 1995, and his researchers now include one research assistant, four doctoral students, two master's degree candidates and two undergraduates. They study Borrelia using a variety of biochemical, genetic and molecular techniques. The lab is funded by grants from the National Institutes of Health, the National Science Foundation and the Arthritis Foundation.

Samuels says Borrelia is an unusual organism, since it carries its genetic information on mostly linear pieces of DNA. Bacterial species normally use circular pieces of DNA, and scientists don't understand how Borrelia replicates its linear DNA. Unraveling this mystery could lead to methods that stop Borrelia from reproducing.

Borrelia also wears a different coat of proteins when inside ticks than when inside mammals. Inside the arachnid, it wears what researchers call Outer Surface Protein A — or OspA — and it wears OspC inside mammalian hosts.

"Basically it comes up with different programs of gene expression," Samuels says. "It's a blonde inside of mammals and a brunette inside ticks."

Samuels says that somehow Borrelia knows it should produce OspA inside ticks and OspC inside mammals. One signal for the bacterium to produce different surface proteins is temperature.
since mammals are normally much warmer than ticks. Temperature can change supercoiling, a phenomenon in which the organism's double helix of DNA wraps itself tighter, much like tangleing a phone cord. Heating, for example, causes the DNA to untangle. Janet Alverson, a doctoral student in Samuels' lab, has shown that changes in supercoiling can cause the organism to express different genes, such as those that encode OspA or OspC.

Samuels says one of his greatest achievements was developing a genetic system for studying Borrelia—a way for researchers to manipulate the bacterium genetically and disrupt certain genes.

Working with researchers at Rocky Mountain Laboratories in Hamilton, Samuels' crew did a knockout of ospC, the gene that encodes OspC. But even without this gene, the Lyme disease bacteria continued to grow just fine in culture. Samuels says this doesn't necessarily mean ospC isn't important for transmission of the disease, however, because researchers have not been able to disrupt the gene in a virulent strain of Borrelia. Samuels' crew uses a nonvirulent strain for research.

There is no absolute cure for Lyme disease, which seems to affect every victim differently. Some patients treated with antibiotics in the early stages of the disease usually recover rapidly and completely, while others experience symptoms of persisting infection all their lives. However, a Pennsylvania lab appears to have developed a vaccine last year that allows the human body to stimulate a protective immune response to OspA.

Samuels says his lab may find other ways to disrupt the disease. He says doctoral student Scott Knight has discovered a new Borrelia protein that interacts with the bacterium's DNA. How important this protein is to the bacterium remains to be seen.

"That's what keeps you in this business," Samuels says. "You never know when you are going to learn or discover something new."

His lab also is studying Borrelia topoisomerases, enzymes that break apart the bacteria's DNA strands. Topoisomerases can be used as tools to genetically dissect an organism at the molecular level. One of these topoisomerases—gyrase—introduces supercoiling into DNA. Gyrase commonly was thought to work only on circular DNA, but recent work by undergraduate researcher Kendal Galbraith has shown that gyrase also works on the linear DNA in Borrelia. Many antibiotics inhibit gyrase and can be used as tools to genetically dissect an organism on the molecular level, providing Samuels with another avenue to explore.

"We also will be testing many new, next-generation drugs on the bacterium," he says. "In addition, we are developing new ways to study how the bacterium grows. Christian Eggers, another doctoral student, has identified and is characterizing a virus of Borrelia burgdorferi. Bacterial viruses, called bacteriophages, historically have been used to understand bacterial cell growth."

Even though Samuels has never heard of anyone contracting Lyme disease in Montana, the state has long been a hotbed for research into the malady. In fact, Borrelia burgdorferi is named for Willy Burgdorfer, a longtime researcher at Rocky Mountain Laboratories who first identified the bacteria that cause Lyme disease. Samuels worked at that facility for four years before coming to UM.

"I love working at UM," Samuels says. "The research we have been doing here has been the most exciting part of my scientific career to date."
Addiction Research Goes High-Tech

"To cease smoking is the easiest thing I ever did; I ought to know because I've done it a thousand times."

This nicotine addict was none other than Mark Twain, popular 19th-century American humorist and satirist. His words point to a devilish fact – how difficult it is to break away from an addictive substance.

"Most people who quit any addictive substance quit not on their first, second or even third try," says Michael Hufford, an assistant professor of psychology at UM. "They have to try many times to stop, learning a little something new each time. It turns out that the most common outcome of addiction treatment is relapse. That's not a fault of treatment providers. It's simply a characteristic of the illness."

Hufford has studied addiction for several years, focusing on the relapse and recovery process. In one of his current projects, he’s collaborating on a study of alcoholics with Dorothy Lescantz, head of the Addiction Treatment Program at Missoula’s St. Patrick Hospital.

Using the data they collect on patient characteristics, the researchers aim to learn how to predict who will recover and who will return to using alcohol. Better understanding of the relapse process will help treatment providers in their efforts to keep their patients sober, Hufford says.

He and Lescantz collect data two ways. One method uses the standard interview and questionnaire, before and after treatment. The pre-treatment questionnaires assess certain psychiatric variables, one of which is co-morbidity – whether in addition to alcoholism a patient has one or more psychiatric disorders such as depression, schizophrenia or anxiety. Co-morbidity is a strong predictor of an alcoholic’s success or failure in the recovery process, Hufford says.

The post-treatment interview goes into questions like "Are you drinking?” and, if so, "Oh, what happened?" Because in standard addiction research this interview comes a month or more after discharge, what the patient can recall is usually inaccurate and biased, Hufford says.

This is where Hufford and Lescantz’s other method comes in. It’s cutting-edge, he says, because it uses electronic diaries, sometimes called palmtop computers. Select patients in the study carry a diary at all times, programmed to beep at regular intervals, signaling the start of an interview designed to reveal whether the patient’s mood or other surrounding circumstances affect the craving for a drink. When the diary’s tiny screen displays, for example, “Rate your alcohol craving” and a range of questions such as “Are you depressed?” the patient registers a response on a scale of low to high by touching a small spot on the screen. The diary also asks about the patient’s attendance at Alcoholics Anonymous.

Although the diary beeps at preset intervals, patients are instructed to log in for a customized interview any time they feel tempted to relapse, Hufford says.

"By using this device, we’re collecting data minutes after events occur rather than months after," Hufford says. In theory, the immediacy of this information makes it more accurate than recalled or retrospective data.

The diary stores all the data for one week. The patients, who are paid for their participation, report every week for a month, and Hufford uploads the diary data onto a computer, creating a huge database.

At their post-treatment interview, the patients fill out a questionnaire that asks many of the same questions they answered on a daily basis during prompted or self-initiated interviews with the diary. The questionnaire gathers information based on what the patient can remember about specific situations during the past month.

This retrospective information is compared to the “real-time” data collected with the diaries. The researchers then look at whether the self-reported measures of a patient’s ability to refuse drinking in high-risk situations correspond to the real-time reports. From this comparing process, the researchers can determine how accurate or inaccurate the retrospective data are.

"This is an important subgoal," Hufford says. "But it’s not the endgame. One of the things we’re most interested in is the extent to which the data we collect during the one-month monitoring will predict eventual outcome – whether the patient stays abstinent or returns to drinking."

Only two other laboratories in the nation are using this methodology to understand alcoholism. Seed money for the project came from the Montanans On a New Track for Science (MONTS) research program based at Montana State University. The program gets its funding from the National Science Foundation.

— Terry Brenner
Stories of the Everyday

Janet Finn once had a career in child and family services—until the day she couldn’t handle the wrenching dilemmas people brought her anymore and decided she needed new ideas on which to base her practice. So she immersed herself in studies of gender, culture and social change at the University of Michigan, concentrating on the participation of women in labor movements and earning a joint doctorate in anthropology and social work.

“In general,” says Finn, “women have been left out of labor history or mentioned only in the context of doing the things men do—marching or joining the picket lines.”

Finn does not remember women doing those things when she was a child growing up in Butte. Even though hers was not a mining family, it, too, felt the effects of the nine-month strike—then longest in Butte’s history—against the Anaconda Co. in 1967, when Finn was just 11 years old. “It was the moment when the words ‘strike,’ ‘scab’ and ‘picket line’ took on meaning for me,” she says.

Finn chose the ’67 strike as the subject for her dissertation research but, after careful listening to her women informants, realized she had to alter her original concept. By the third cup of coffee, she says, the discussion would invariably begin to range from the strikes of the ’30s, ’40s and ’50s to the closure of the mines in the ’80s. The Butte women described their strike experiences to Finn as part of an ongoing cycle of community life, modulated by three-year labor contracts.

Women were in a double bind during these strikes, Finn says. They were responsible for putting meals on the table but were not in a position to earn the wages. Instead, they directed their actions toward food prices, health issues and family survival.

“They actions had to do with mobilizing families and friendships to get through each crisis, in doing what they had to do to keep families fed and intact,” Finn says.

In 1994 Finn came to UM, where she now combines teaching, research and community service. As an ethnographer, she writes about the experiences and stories of working-class people as a way to understand how ordinary people “craft the everyday.” Their stories of mutual support networks during tough times and of a resilient sense of humor reflect their sense of identity, dignity and place in the world, she says.

“These kinds of stories are too often undervalued in history now,” says Finn, “and often are eclipsed by a stronger sense of individualism and professionalism.”

Finn’s research into women’s participation in labor movements and in shaping community life is ongoing. Friends made while she worked on her book, “Tracing the Veins of Copper, Culture, and Community from Butte to Chuquicamata,” led her to bring a Chilean mother and daughter to Montana for an extended visit. During their stay, UM and community audiences heard firsthand accounts of the “disappeareds”—relatives and friends who were kidnapped and murdered under the former military dictatorship—and of the women’s ongoing search for truth and justice in their own country. (See book preview on page 25)

Finn also has started a project to document women’s social and political organizations—such as Women’s Opportunity and Resource Development, Women’s Voices for the Earth and Working for Equality and Economic Liberation—that are active in Montana and the region.

With the help of a University summer research grant, she has begun preliminary work to collect oral histories about how the groups have evolved over time to further women’s development. Through her contacts at Santiago University and UM connections at the University of Concepcion in Chile, Finn hopes to identify similar grassroots organizations in Latin America and eventually develop ways to share their collective lessons with a wider audience.

Research is never separate from teaching and community work, Finn says. Whether in her social work course on gender and the politics of welfare or in an anthropology/environmental studies class on mining cultures, she encourages students to seek answers to real-world questions.

“My research experience has been so life-changing and rewarding,” she says. “I think students can be engaged by the possibility that their own questions are important and that they can pursue their own classroom visions into the real world.”

— Caroline Lupfer Kurtz

24 Vision 1999
After years of research in college library basements and dusty book stacks, a UM assistant professor of history has published one of the first full-length studies of an early-19th-century American marriage.

"Marriage in the Early Republic: Elizabeth and William Wirt and the Companionate Ideal" by Anya Jabour uses the extensive correspondence of the Virginia couple to explore marital relationships of the era.


By focusing on the Wirts' relationship, Jabour addresses debates among historians about how men and women related to each other in the past and gives insights on how we got to where we are today.

Though "Marriage in the Early Republic" takes a historical tack, its main concern is the relationships between men and women — what they want out of them and why they sometimes experience them differently.

Jabour says the publication of books like "Men Are From Mars, Women Are From Venus" shows that this is an important issue for a lot of people right now. By learning about Elizabeth and William Wirt, she says, people also can learn about their own relationships.

Jabour is able to investigate the newly created ideal of marital togetherness and happiness at a time when men and women often lived separate and unequal lives. The Wirts, who strove for a companionate marriage, revealed the difficulties of the ideal in thousands of letters written to each other.

Living in Virginia and Maryland, William Wirt practiced law and was attorney general under James Monroe and John Quincy Adams, while Elizabeth Wirt cared for home and family. During William's frequent work-related absences, the couple wrote each other very lengthy and detailed letters on a sometimes daily basis.

In "Tracing the Veins of Copper, Culture, and Community from Butte to Chuquicamata," anthropologist and social work Associate Professor Janet Finn explores the interrelationships of capitalism and community as played out from the 1920s to the 1970s between the giant Anaconda Co. and its copper-producing hubs in Montana and northern Chile. She does so by rooting out and telling the "unofficial" histories of those places through the stories and experiences of working men and women.

Finn returned to her childhood home of Butte in 1991 to research her doctoral dissertation on women in the labor movement — specifically their experiences during a nine-month strike against the Anaconda Co. in 1967. She soon began hearing a much larger tale, one of ongoing cycles of community life shaped over decades by periodic labor contracts, strikes, lockouts and layoffs. She also heard a faint but insistent refrain about Butte's sister city of Chuquicamata. Situated in the high Andean desert, "Chuqui" produced even more wealth for the Anaconda Co. than Butte did and was held as a distant, yet constant, threat over the heads of Butte workers.

The book is a rich deposit of political and cultural history, written with a deep sense of involvement in the subject. Some sections of the book address specific theoretical debates in cultural anthropology and labor studies, but Finn also caters to readers more interested in the general history of people and places.

Finn's premise is that communities everywhere are strongly affected by corporate practices and that historical cases are relevant to global social and economic development issues today. Companies like Anaconda, interested in ensuring at least three generations of workers, invested extensively in schools, hospitals, parks, sports and the arts.

Although there were downsides to this sort of corporate paternalism, Finn says, the shallow-rooted multinational companies today make almost no investment in people or place in their search for getting the most labor for the least money. In a world being shaped by transience in the global workplace, she says, much can be gained by examining the linkages between presumed strangers such as Butte and Chuquicamata.
PROTECTING A BEAUTIFUL PLACE
UM Assists Landowners With Unique Conservation Easement

Nestled in the Blackfoot Valley, the E Bar L Ranch is a special place. Deer, elk and bears wander there among the ponderosa pines, where the Clearwater and Blackfoot rivers come together. People from all over the world also visit the E Bar L, which is one of the oldest continually operated guest ranches in the West. It's a place with the power to renew mind, body and soul.

Rancher Bill Potter says his dad fell in love with the area while working as a surveyor for the Milwaukee Railroad in 1913, and the Potters have been a prominent fixture in the valley ever since. Potter knows the ranch is special — England's Prince William even vacationed there a few years ago — and he wants to ensure the area is preserved for future generations. So his family entered into a conservation easement agreement this fall with the Nature Conservancy and UM to forever shelter 4,000 acres from development.

"What we are trying to do is establish something for perpetuity," Potter says, as deer graze behind him on his ranch. "You can't just walk away and think this will always be the same.*"

The easement, which prohibits subdivision and new homes, is unique because it allows for harvesting of the ranch timber resources in a sustainable, ecological manner. The easement also requires active forestry management from the Potter family, the Nature Conservancy and UM.

The Nature Conservancy, an organization committed to preserving plants, animals, natural communities and diversity, will contract with UM to help manage the ranch's timberlands.

The easement land is located about six miles northeast of UM's 28,000-acre Lubrecht Experimental Forest, which is used by the University's School of Forestry for research, demonstration projects and education. Lubrecht director Hank Goetz was instrumental in developing the conservation easement for the Potters.

"We basically view this as an extension of the Lubrecht Forest," Goetz says. "We have had a good working relationship with the Potters for the last 25 years or so, and this agreement will help us maintain that relationship. Bill has always been good about allowing us to use the ranch for research and demonstration — basically the same things we use Lubrecht for."

Goetz says the easement is cutting-edge because it requires active forest stewardship. It's the only conservation easement of its kind in Montana.

One clause in the easement limits cutting on the land to annual growth. Goetz says new growth is about 150 board feet per acre annually in that area, so about 300,000 board feet — roughly 100 truckloads of logs — still could be harvested each year. UM staff and possibly forestry students will monitor the easement to ensure the proper amount of timber is harvested.

"We wanted to set a limit but not tie the hands of future landowners," Goetz says. "Who knows? Markets and technology may change in the future, so we wanted to leave a little leeway."

The Potters, UM staff and Nature Conservancy officials will meet every September to decide together how to best manage the easement land.

Signing the easement gave the Potters benefits other than good forest management and land preservation for the future. Since the land can't be subdivided, its value has dropped, which gives the Potter family tax breaks.

Goetz says the Potters are role models for how private landowners should strive to increase the health of their timberlands. The Potters have developed their own logging methods, and Goetz says they are moving toward an uneven management style, in which trees of different ages are located together, creating a healthier forest.

The Potters often leave the best trees in a stand, making the forest more like what occurs in nature. Their method of logging also provides a long-term flow of income that is sustainable over the years. Potter says his ranch was one of the first places logged in the Blackfoot Valley back in 1885, and he dreams of returning his forests to pre-logging condition.

"It takes four or five generations to establish a good stand of timber," he says. "What I'm trying to do is establish a tradition."

— Cary Shimek
Life After University
Research Gave Young Teacher a Firm Foundation

As a student at UM, Stephanie Nadasi knew what she wanted: to teach high school science. The way to teach it well, she thought, would be to understand it from the inside. She found a mentor in Carol Brewer, an assistant professor of biological sciences.

“I walked into Carol’s office, said I was looking for research experience, and she took me under her wing,” Nadasi says.

Brewer oversees a number of University initiatives to increase undergraduate participation in research. (See related story on page 3)

Nadasi worked with Brewer on several plant eco-physiology studies and was able to present her results at a national scientific meeting.

Nadasi’s paper “Night Freezing in Plants” won an award for excellence from UM’s Phi Kappa Phi honor society.

She also received a President’s Recognition Award, given to the top senior from each school and department.

“Stephanie is one of those students you hate to see go, but you know they are going to be great,” Brewer says.

“Because of her research experience, she’s not going to be teaching from a textbook.”

Last May, Nadasi, 25, graduated with a degree in biology and a double endorsement to teach biology and broad-field science at the secondary-school level. She and her husband moved to Norfolk, Neb., where he is doing a clinical psychology internship, and she is teaching at Norfolk Senior High School.

The demands on a first-year teacher are great, Nadasi says — she teaches four introductory biology classes and one upper-level physics class, plus acts as the assistant speech coach. Her days begin at 5:30 a.m. She’s at school by 7:30, home by 4 p.m. if she’s lucky. Then she has at least four hours of grading and preparation to look forward to at night.

But she loves her classes, especially biology, and finds that her research with Brewer gave her a fund of examples to draw on and confidence in her knowledge of the subject and how research is done. She says that tough questions, or ones she can’t answer on the spot, don’t bother her.

“Doing research taught me about the process of scientific inquiry and that the process of learning and discovery is just as important as the outcome,” she says.

Her strategy in the classroom has been to stay away from lectures and spend more time discussing experiences — her students’ and her own. In her view, development of critical thinking skills is more important in the long run than learning facts and figures by rote.

Despite Nadasi’s love of science, there are some things about teaching that all the research experience in the world could not prepare her for.

“No one can prepare you for the emotional highs and lows,” she says. “There are days when I’m charged up and feel I’m making a difference. Then there are days when I just want to crawl in a hole and never come out.”

Nadasi looks forward to not being a rookie teacher next year.

Although the daily grind can be wearing, she says, at least no two days are exactly the same.

“Anyone who thinks teaching is easy is crazy,” she says. “I have so much more respect for teachers now. It’s got to be one of the hardest jobs there is.”

— Caroline Lupfer Kurtz
Biological sciences Professors Ken Dial (in nest) and Dick Hutto (above) with feathered friend.
UM graduate student Sophie Osborn and Professor Ken Dial examine an American Dipper during the recent filming of an “All Bird TV” episode in the Bitterroot Valley. (UM photo by Todd Goodrich)