Why publish a magazine that highlights research at an undergraduate, teaching university?

At Chico State, it’s because we’re putting our priorities in order and getting it right.

The first prerequisite for excellence in teaching is that the teacher possess true knowledge. Currency in one’s discipline and the ability to transmit effectively that knowledge are what earns one the respect of students and colleagues.

Through research, faculty define the issues and examine the frontiers of knowledge in their disciplines and how they connect—and collide—with others. But they also meet the challenge of distilling what they find for an audience. For good research, like good teaching, must pass tests that demand clarity, integrity, and purpose.

A particular feature of this publication is student research. And, again, it’s because we get it right here about the place and role of research. Faculty who bring their research to their students accomplish more than engaging them in academic study. These faculty “teach” with the force of personal example, inviting students to a journey of discovery that is as much about mastering a field of study as it is stimulating a loving and positive attitude towards new and exciting knowledge.

Yes, this publication celebrates faculty research. More importantly, it reminds us of what kind of university we are and the place and role of research here. For the research and creative endeavors of our faculty make us a better place, a more interesting community, and a more successful university.

—President, Paul Zingg

Have you ever designed an electronic simulation?
Eradicated a pesky garden plant?
Discovered an easier way to check your spelling?

Each day faculty and students at Chico State explore, discover and create through their research. They find solutions to problems that improve our daily lives. And they enrich teaching and learning by bringing new ideas to classrooms across the campus.

For many years, federal, state and local agencies and businesses have partnered with the Research Foundation so that they too can benefit from the extraordinary expertise found at Chico State. Some of the research partners include the National Science Foundation, the US Departments of Education and Labor, for-profit and non-profit corporations, numerous California state agencies, and dozens of cities and counties throughout the state.

Research projects often begin when a faculty member visits the Office of Research and Sponsored Programs to say, “I have an idea I’d like to pursue.”

In our office, the immediate response is “Let’s explore the possibilities.” While the resulting projects last a finite time, the discoveries endure.

—Vice Provost for Research, Katie Milo

I hope you enjoy Research and getting to know a few of our outstanding student and faculty researchers.
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The Reserve
By Stephanie Miles
Ten miles outside of Chico there is an unmarked road you have to look for to notice. A half mile down its steep twists and turns, where pavement meets gravel, the view opens to 4,000 acres of green meadows, steep canyon walls, and enormous oaks. Welcome to the Big Chico Creek Ecological Reserve (BCCER).

A house, fronted with windows and looking down on a quaint barn, serves as a starting point for scientists, students, artists, and nature lovers. Here students, professionals, and adventure-seeking community members can gear up before heading out for a day on the reserve for everything from scientific and archaeological research to art projects to bird watching.

Jeff Mott, BCCER’s research manager (pictured at left), noted that just six years ago none of this was available. The land belonged to local ranchers who were approached by the Big Chico Creek Watershed Alliance coordinator, Suzanne Gibbs, to discuss their interest in selling it to the University. The ranchers agreed to sell, and with financial assistance from the California Deer Association, California Department of Fish and Game, Packard Foundation, River Network, Wildlife Conservation Board, and the U.S. Fish and Wildlife Association, funds were raised and the land was purchased. It is now owned by the CSU, Chico Research Foundation and managed by the campus-based Bidwell Environmental Institute (BEI).

Dozens of scientific surveys are currently being conducted at the reserve, from collaring deer to measuring the area’s number of small mammals. Even so, Mott noted, “This isn’t just for natural sciences students.” University anthropology and history classes use the site to study such things as Native American house pits and 19th-century flumes.

Research by history students has shown that the entire canyon was once filled with bustling families and ranches. Rock walls, built to define their land, are now covered with moss but remain standing for the most part. A large grouping of brown, aging cans sits piled on the green grass in one area. To the untrained eye, they look like trash, but they’re actually remnants of the settlers. “It’s sort of a dump, but we love it,” Mott said.

On Sundays, hiking tours are given by Roger Lederer, professor meritus of biology. Groups trek through as much of the land as their skills allow, sometimes catching glimpses of bear, turkey, deer, and mountain lions.

Along with the variety of animals found at the reserve, there is also a wide diversity of plant life. Shortly before the land was purchased in 1999, logging took place in the area that completely changed the habitat. Since then, the land has flourished. At least seven species of oak trees grow in the area, some 200 years old. What’s most unique, Mott said, is having chaparral, oak woodland, riparian, and grassland habitats all in one place. When it comes to animals, the land supports 140 wildlife species, 13 percent of which are listed as species of special concern according to Mott. “It’s just amazing to get that much variety,” Mott said.

Before becoming manager of the BCCER, Mott managed the University’s health and safety office. He received his degree in biology from Chico State and the outdoor spirit never left him. So when his current position became available he jumped at it.

Each May, Mott hosts Candles in the Canyon, an on-site fund-raising event that lures community members to the land with the promise of an elegant dinner under the stars. “[We’re] trying to engage the community in what we’re doing up here,” he said.

The event is just one of many funding sources for the reserve. It takes a lot to keep the 4,000 acre property functioning, including the dozens of volunteers who work hours clearing underbrush, invasive plants, and gravel roads on a daily basis. Some volunteers, such as retired Chico State biology professor Paul Maslin, work up to 10 hours a day on the land. “He’s retired and he spends more than full time up here,” Mott said. “It’s a lot of hard work.”

Because a creek runs through the middle of the reserve, there’s currently no easy access to nearly half of the land. In the future, Mott said he’d like to get the funding and volunteers to create more roads and better access throughout the site. But getting that done is going to take more than just money. It’s going to take both time and a concept of how to do it. “I have lots of ideas, but you can’t just lay them all out there and expect everyone to love them,” Mott said.

Having better access to the location would make 20- to 30-year research projects possible. “My goal is to try to get those length studies underway so if a student is looking for a research project, we’ll have it set up,” he said.

Although the concept of a university-run nature property isn’t unique, Mott said it’s the extraordinary combination of wildlife, plants, and natural grasses on one property that sets Chico State’s reserve land apart.

“Other universities have preserve properties, but not like this,” Mott said. “I wouldn’t trade any of them for what we have here.”
When 10-year-old “David” came into the Chico State Autism Clinic for the first time, he was very apprehensive. “He kept saying ‘bye-bye’ to his mother because he didn’t want to be there,” said Rebecca Lytle, Adapted Physical Activity Program coordinator.

The next time, Lytle gave “David’s” mother a little advice to get him excited about coming. “I told her to tell him he’s coming to play, and he can do anything he wants,” she said. When he arrived for his second session at the clinic, “he came running in the door,” said Lytle.

And what kid wouldn’t be excited? From every corner of the room, toys, games, and activities, flow into the middle of the room. A blue foam pit lies in the back corner, fun for jumping and moving. A trampoline and the beanbag chair next to it protrude from the wall. There are 10 squares on the floor, forming a hopscotch game. There is a 7-foot-tall rock-climbing wall with colored rocks jutting out for hand and foot-holds. On this afternoon the song “Accidentally in Love” from the movie *Shrek 2* drifts from a boom box. Orange juice and water bottles clutter the small table. There is a children’s tent, the kind made out of plastic poles and a thin vinyl covering, usually covered with Barbie or Dora the Explorer graphics. The toys and games are tools that Lytle and her student staff use to create a playful and relaxing environment for autistic children in the Chico State Autism Clinic.

The California Department of Developmental Services (2003) reported that the number of persons with autism/PDD doubled from 1998 to December 2002, reaching more than 20,000 individuals. During the 2002–2003 school year, more than 120 children with autism in Butte County were receiving services from local educational agencies.
Autistic Spectrum Disorder, according to the American Academy of Family Physicians Web site, is a “pervasive developmental disorder” involving “abnormal development of social skills (withdrawal, lack of interest in peers), limitations in the use of interactive language (speech as well as nonverbal communication), and sensorimotor deficits (inconsistent responses to environmental stimuli).”

The Autism Clinic focuses on teaching autistic children basic sensory and motor skills while providing a hands-on learning environment for the Chico State students who work there. Lytle learns from the Autism Clinic as well; she conducts research, trying to find the most effective ways to teach autistic children.

Since the clinic opened in 2003, Lytle and her students have seen between 30 and 35 children. Now they see about 10 children per week in the cozy, colorful lab. The children receive individualized one-hour sessions with activities aimed at developing and improving their sensory and motor skills. The children probably think of the clinic as a “fun place to come and play,” said Lytle. “The kids who come really look forward to coming.”

The children get to choose which activities and games they want to play or do first. Many autistic children can be hypersensitive to their environment, Lytle said. By letting them choose, they become calm and relaxed, making it easier for them to learn. Once the children gain confidence in one area, they can move on to something more challenging. Throwing a ball back and forth between two people, for instance, creates an opportunity for the child to interact with another person and be social.

“It’s a dance between what the kids really want to do to play, and pushing them to learn new skills,” said Lytle. “We break it up so they can be successful. By creating success, they feel good about themselves.”

Lytle’s work in the clinic also helps her to become a better instructor because she has examples to teach in the classroom. “I continue to learn and grow professionally the more I interact with the children and families,” said Lytle. “Anybody who’s in professional preparation needs to stay close to their practice. All of the hands-on programs help me to continue to develop my own skills.”

By collecting consistent data and working with the children, Lytle and her students can help future educators who will work with autistic people to develop intervention and teaching strategies. The program currently funds five graduate students from different academic departments who work with Lytle in the clinic. Five other students work in the clinic through their classes.

They do connect with other people, and they do want to interact…They’re kids just like any other kids. It just takes them longer to feel comfortable with people.

—Rebecca Lytle

“The students] get a much better understanding of the disability of autism and what it means,” said Lytle. “It gives students a great learning experience. I really believe in practical experience.”

The Students are also involved in the research that takes place in the lab. For example, two students went along with Lytle to Italy in summer 2005 to present data they collected from a four-year-old child over a period of one year. According to the study’s abstract, the data showed an increase in the child’s “motor acquisition skill,” “joint attention” with others, and “time on task” as a result of the intervention program at the autism clinic. These findings show that some of the stereotypes of autistic children are inaccurate. The children are often seen as being unable to make connections with people, and as lacking emotion because they don’t make eye contact, explained Lytle.

“It doesn’t mean they won’t,” she said. “They do connect with other people and they do want to interact with other people. They’re kids like any other kids. It just takes them longer to feel comfortable with people.” After working with the children for a while, they will “look you right in the face,” said Lytle. While Lytle has always been interested in physical activity, her interest in the hypersensitivities of autistic children came when her daughter was born. Although her daughter is not autistic and has no disabilities, Lytle said she had trouble getting her to sleep as a baby. Her daughter was very sensitive to the environment around her but was calmed by certain noises in her environment. Lytle found that the sound of the vacuum was the only thing that could help her daughter fall asleep. Before she wore out the vacuum, Lytle recorded its sound and played it next to her daughter’s bed at night, sending her into a peaceful slumber.

Lytle continues to learn whenever and wherever she is in order to bring more knowledge to her students within a variety of venues. As she continues her research on autism and maintains her focus on making lives better, she brings excitement to her work that’s engaging and productive for all.
Although it’s tempting to think so, Thomas Mattman wasn’t born a knot-tying prodigy who could fasten a necktie before he could walk. Nor did he grow up to be a crack Eagle Scout capable of executing two half-hitches in record time.

“I’m really poor at tying knots,” confessed Mattman, an associate professor of mathematics at Chico State. “Students come up to me and say, ‘How do you tie a double sheepshank?’ and I say, ‘I have no idea.’”

One might assume the opposite given Mattman’s field of research—an area of mathematics known as Knot Theory. But the knots Mattman favors are not the ones he has to tie and untie in everyday life. His knots inhabit a more abstract world, one that grapples with these central questions: Given two knots, are they the same or not? Is there some way to manipulate one to make it look exactly like the other?

This is more complicated than it seems—indeed, it’s a problem that has stumped mathematicians for more than a century. “Two knots that are in fact the same might initially look very different from one another,” Mattman said. “It’s not usually something you can decide just by looking at the knots in question.”

To help his students compare knots, Mattman might first have them make their own knot models. In his second-floor Holt Hall office, he demonstrated, reaching into a tangle of props on his desk and fishing out a green extension cord. “You tie a knot in the usual way, like you would do if you start tying your shoes,” he said, making a big loop in the cord. (Regarding his own footwear, Mattman goes lace-free. “I prefer sandals,” he said, pointing to a well-worn pair of Birkenstocks.)

After the cord is looped, Mattman has students fuse the loose ends so that the knot is trapped within it. The extension cord is handy for this because one end can be plugged into the other. The knot is then ready to be manipulated into all kinds of positions—anything goes as long as the loop remains unbroken—to see if one knot can be twisted to exactly resemble another.

It’s called a “topological” approach, sometimes referred to as “rubber geometry” because of the way things can be arbitrarily
deformed. But students graduate quickly from their extension cord models to sketches on paper, attempting to see if two complicated drawings of knots are the same.

The origins of Knot Theory can be traced to the 1880s, when the chemist Lord Kelvin theorized that different knots might represent the different elements found in the universe. Scientists went so far as to construct a table of the elements with distinct knots twisting this way and that to represent helium, carbon, nitrogen, and the like. That notion was soundly rejected with the advent of the Atomic Theory of Matter, but mathematicians continued to ponder knots and their significance, eventually tabulating some two million knots.

Over the next century they came to find that Knot Theory had important applications for chemistry, biochemistry, and physics. In the field of DNA research, for example, researchers are aided in their understanding of the knotting and unknotting of strands of the molecule DNA (deoxyribonucleic acid), which carry an individual’s genetic information. In chemistry, efforts have been undertaken to form knot-shaped molecules to explore how the properties of the molecule depend on shape.

Mattman, a Canadian, first got interested in knots as a graduate student at McGill University in Montreal, where he earned his doctorate before coming to Chico State in 2000. “This idea of rubber geometry fascinated me,” he said, “At the same time, I had an interest in algebra. Knot Theory was a way of bringing these two together.”

Since his arrival, Mattman—who also teaches courses in geometry, calculus, and linear algebra—has made it his business to try to inspire a similar kind of fascination in math students.

He’s brought in federal grants totaling more than $250,000 to start programs geared especially toward undergraduate math students. June 2006 marks the third year of Research Experiences in Mathematics for Undergraduates and Teachers (REU/T), a six-week program funded by the National Science Foundation (NSF) that brings six students from around the nation to Chico State for what Mattman called “an intensive summer camp for math.”

The idea is to produce more home-grown mathematicians and scientists.

“Students come from all across the country and live in the dorms,” explained Mattman, the program’s principal investigator. “We get students from Berkeley and Stanford and some pretty strong undergraduate researchers. We also hold a couple of places for our own students.”

Two knots that are in fact the same might initially look very different from one another... it’s not usually something you can decide just by looking at the knots in question.

—Thomas Mattman

One of those students was math major Gabriel Maybrun, a senior at Chico State who currently is working on his honors thesis with Mattman. “It was quite an intense experience,” Maybrun said, describing eight-hour days of math immersion. “I was being introduced to fields of math I never knew existed.”

The REU/T schedule consists of a one-week “crash course” in Knot Theory, followed by a week devoted to research papers that students read, digest, and present to each other. Mattman then assigns them their own research problems to tackle during the remainder of the session. “They’ll eat, sleep, and breathe [those problems] for the next four weeks,” he said, “just thinking about them and trying to make progress.”

A key to the success of the program—one of 30 NSF-funded sites nationwide—is that it also invites four secondary school mathematics teachers to participate alongside the undergraduates. “Chico State has a long tradition of preparing teachers,” Mattman says. “The novelty of our site is that teachers are also participating.” Their involvement benefits teachers professionally while modeling a career path for students. Running parallel to REU/T is another summer program Mattman started in 2003, with funding from the National Security Agency, called Strengthening Underrepresented Minority Math Achievement (SUMMA). SUMMA brings to campus local minority college students who have the desire to pursue careers in mathematics.

Mattman’s focus on priming undergraduates for scholarly research has apparently not slowed his own. Since arriving at Chico State, he has written 12 research papers which he submitted to peer-reviewed journals, including the prestigious Transactions of the American Mathematical Society.

The summer programs he’s started have enabled him to carry out some of his most rewarding work—collaborations that have resulted in numerous co-authored papers with budding young mathematicians, some of whom have gone on to graduate programs in mathematics at universities such as UC Santa Barbara and UC Davis.

Last summer, Maybrun’s project in the REU/T program grew into a formal paper dealing with Knot Theory that he wrote with Mattman and another student. That mentoring has been invaluable, said Maybrun, who plans to pursue a doctorate in mathematics beginning in the fall.

Mattman’s upbeat teaching style and enthusiasm for engaging students in scholarship has yet another effect. “He seems very excited and very happy to be doing research,” Maybrun said. “This rubs off.”
Life Imitates Art

By Amanda McLemore
Associate Professor Masami Toku is a petite power ball. Much like the subject of her research, Toku is busy and complex. Her interest in bridging the cultural gap between Japan and the United States through art is displayed in an exhibition featuring manga that is traveling worldwide. Manga is a popular comic book style/soap opera that matures in content according to the age of its readers. Children in Japan begin reading manga in preschool. As a result, they become familiar with the characteristic symbols and are able to read the stories very quickly.

Toku does not create manga art and even lost interest in it for many years. But she has come to appreciate the artistic and historical value of it. It is sensible to use the art form to facilitate understanding of Japanese lifestyle, since the growth of manga in the U.S. is phenomenal. According to Fortune magazine, anime and manga are “making a killing” in the United States. The magazines are about 500 pages long and there are approximately 15 stories in each. The tales are continuous, which inspires the reader to buy the next monthly issue. Some tales last as long as 30 years.

Toku developed her exhibition, Shojo Manga Power! using numerous pieces of manga art created by 23 Japanese artists from many generations. Shojo manga, translated simply, means “comics for girls.” It encourages the advancement of women as “powerful, self-reliant individuals,” according to the exhibition catalogue. The show chronicles the changing roles of women in society. In early manga women were portrayed as wives and mothers, and girls fantasized about whom they would marry. Modern shojo manga focuses on the strength and independence of women.

Since manga is a prevalent part of Japanese culture and has been for centuries, many forms and eras are represented. The exhibition, which explores parallels as well as differences in Asian culture and American culture, is traveling to universities all over the country. When the American tour is over, the exhibition will continue in Asia.

Born in Naze City in Japan, Toku was the eldest of three children and the only girl. Western influence surrounded her growing up near Okinawa, the largest U.S. military base in the world. After watching her mother struggle with the weight of multiple responsibilities, Toku rejected the traditional role of a Japanese woman. “I ran away from Japanese customs to be a woman,” Toku said.

With a thirst for education, Toku enrolled at The Women’s College Yokohama in Satellite City, Tokyo, majoring in Japanese Literature. After she graduated, she landed a lucrative job with Mitsubishi Chemistry Company, where she worked in the inorganic chemistry analysis lab. She stayed there for 10 years, longer than expected of most women.

Toku visited America and Canada in search of change and to continue her education. At 28, she “felt old.” She did not adhere to the societal norm of becoming a wife and a mother. She couldn’t return to college in Japan.

Toku moved to the United States in 1989 and pursued an education in art at the University of Illinois, Champaign. At first she wanted to be curator at a museum. However, after teaching a class at the Japanese School in Chicago, she changed her major from fine art to art education. There she met and fell in love with “a long-haired American guy,” Jon Lennon Aull, much to the dismay of her traditional parents. Aull was working toward his master’s degree in recreational administration. They married and had a son, Thelonius Kai Aull.

“When my son was due, I was writing my defense for my doctorate. The doctor said I needed to stop and come to the hospital; my blood pressure was high. He asked me, ‘What’s more important to you, writing this paper, or your baby?’ I told him that I have known this child for nine months, but I’ve been working on this paper for two years. I finished the paper and had my son the next day.” Soon after their son was born, Toku and Aull looked west to settle. They relocated from chilly Illinois to Chico, California.

Toku is advisor for single-subject art education majors. She teaches a myriad of art classes, including art appreciation for non-art majors. According to Toku, she is the only faculty from Japan teaching art education, male or female, in the United States.

“She inspires women to achieve greatness,” said student Robin Manzo. She is the happiest, smartest, most energy-charged, hardest teacher I have ever had. I can’t help but love her.”

In addition to her accomplishments at the University, Toku became involved with the community by starting The Japan-Chico Mothers and Wives Club. They meet every Saturday. They teach the children Japanese and practice customs while sharing their heritage. The first Saturday of each month is reserved for an open meeting at the Chico Public Library, where members of American society can be exposed to Japanese tradition and culture.

“She always has a project going. Sharing is her quality. She’s like the glue, creating a Japanese culture here in Chico,” said Shigemi Minetaka, friend and colleague.

While Toku enjoys the opportunities that Western life affords her, she also respects and embraces her Japanese heritage. She is critical and realistic about both. The name Toku means virtue. “I kept my last name because it tells where I am from; married women must take the husband’s last name in Japan; society is not equal. In this way I am rejecting and respecting my culture at the same time.”

The cross-cultural study utilizing manga is a mirror of the experiences of this rare, aware, and defiant professor. With one foot deeply planted in each society, she is sagaciously bridging the gap between American and Japanese culture, while concurrently critiquing both.
As a college student in Liverpool, England, in the 1950's, Roy Crosbie remembers a world in which most people had never heard of a computer. “In those days, the newspapers liked to refer to them as ‘electronic brains,’ ” said Crosbie, retired professor of electrical and computer Engineering who continues a vibrant post-retirement research agenda at CSU, Chico.

In 1957, during Crosbie’s senior year, he and a classmate built a small analog computer (precursor to today’s digital models), and thus began a five-decade career that has paralleled the development of the computer itself, as well as the sophisticated field of computer simulation.

“This is my fiftieth year building simulations and simulators,” Crosbie said proudly in a clipped British accent that betrays his hometown roots on the Irish Sea coast. Nearly half those years have been spent at CSU, Chico, where Crosbie settled in 1983 after a long tenure at Salford University, near Manchester, United Kingdom.

At Chico, Crosbie honed his skills on computer simulations done in “real time,” which involve creating computer programs that offer a sort of test run for a proposed system, closely replicating how that system would operate if it were real. “Real-time simulation can involve a very expensive mock-up of a flight deck or a power station control room,” explained Crosbie. “Astronauts train in simulators before they go off in a space shuttle.”

In 2001, CSU, Chico’s McCleod Institute of Simulation Sciences—which Crosbie directed before retiring in 2003—was awarded a $1 million grant from the Office of Naval Research (ONR) aimed at developing a real-time simulation of a power system for “all-electric” naval ships, vessels that would run on electric power rather than on fuel.

“The Navy is going through one of its periodic major changes in technology,” says Crosbie, who became principal investigator on the project that includes CSU, Chico researchers Richard Bednar (also retired), John Zenor, and Dale Word of the Department of Electrical and Computer Engineering. “It’s equivalent to when they switched from sail to steam and then from steam to diesel power.”
Crosbie explained: “You have a gas or diesel engine of some kind, a primary power plant, but instead of driving the propellers through gear boxes, you actually use the output of the engines to drive generators that produce electric power.” The electric power requirement is 40 to 50 times that of conventional ships, as it must provide for all of the ship’s needs—the energy required for cooking facilities, air conditioning, and lighting; the electric drive that powers the ship as it moves at high speeds; and the “pulse loads,” or quick, high-energy boosts needed to release electromagnetically-assisted weapons.

“The challenge is to design a system that will produce sufficient energy and convert it to electrical energy,” said Crosbie, “and convert and control it for a variety of applications.” The problem becomes more complex in a combat situation if the ship is damaged. “Let’s say a missile comes in and hits the side of the ship and puts half of the electrical system out,” said Crosbie. “You’ve got to re-configure the system so it maintains the essential services.”

Achieving such a system requires expertise in the area of power electronics—the management of energy flow as it converts from AC (alternating current) to DC (direct current) and back again. The switching happens through AC/DC converters that must be controlled at extremely high speeds.

“This leads to a very complex integrated power system to operate everything that needs to be operated in a ship,” said Crosbie. “The control must be such that power is always available where it is most needed.”

The nerve center for Crosbie’s research is a simple room containing six computers on the second floor of the O’Connell Technology Center. One can easily miss the four digital signal processors, crucial to conducting real-time simulations, stowed compactly below a desk. The space is also home to a rare collegial working environment.

“Roy’s tremendous professionalism and leadership skills have established a culture of cooperation and collegiality in all the research programs in which he has participated,” said research team member Dale Word. “He brings an amazing wealth of knowledge and gentlemanly demeanor that sets the standard for his colleagues.”

Indeed, it was that sense of regard for Crosbie both personally and professionally that lead to his landing the ONR grant. The project has its origins in a professional collaboration Crosbie enjoyed some three decades earlier with former Salford University colleague Narain Hingorani, now an internationally-known power systems expert. The two had worked on simulations together during the 1960s until Hingorani left England for the United States and eventually became a vice president with the Electric Power Research Institute in Palo Alto—and a consultant with the Office of Naval Research.

In the late 1990s, Hingorani phoned Crosbie. “I was working on real-time simulation of HVDC [high voltage direct current] systems and felt that Dr. Crosbie could help me in sorting out the best analytical techniques,” said Hingorani, “a sort of carryover of the high regard I had for him back in Salford.”

From that initial contact, a partnership was forged, and in 2001, the ONR grant followed. Since then, Crosbie and his team have been awarded supplementary ONR grants totaling roughly another $1 million to take on projects such as solving the power supply problems of “autonomous underwater vehicles,” otherwise known as “unmanned submarines,” which CSU, Chico, the lead campus on the project, is carrying out in partnership with the University of South Carolina and the University of Glasgow, Scotland.

Such partnerships are indicative of the links Crosbie has formed with universities across the country and the world during more than 20 years at CSU, Chico. He has successfully garnered funding to promote engineering student exchanges among U.S., Mexican, and Canadian universities and has participated in international societies dedicated to computer simulation, such as the Society for Modeling and Simulation International, for which he served as president in the 1980s.

Crosbie knows and values the virtues of teamwork. But perhaps his best model of cooperation exists here at home with his fellow researchers on the electric ships project. “The team that has developed in this research endeavor has worked a successful partnership for years, has mutual respect for one another, and pride themselves on a job well done,” said Ken Derucher, dean of the College of Engineering, Computer Science, and Construction Management. “This team is second to none and all teams should be as good.”

The challenge is to design a system that will produce sufficient energy and convert it to electrical energy, and convert and control it for a variety of applications. The problem becomes more complex in a combat situation if the ship is damaged.

—Roy Crosbie
Across the hall from Chico State’s Physical Sciences room 206 is a typical science lab, a room filled with pipes, clamps, tubes, and fume hoods. But Physical Sciences 206 is very different. Decorated with colorful charts, maps, pictures, and samples of student work, this is the Science Education Laboratory, affectionately referred to as the Hands-on Lab.

Each year, more than 3,000 elementary school students visit the lab to do exciting science lessons led by undergraduate students who are learning to be teachers. The children’s excitement about being on a college campus and learning science from college students can be heard in the hallway as one approaches the room.

An Evolution of Ideas
The hands-on science program began more than 20 years ago as an assemblage of many smaller outreach efforts by faculty in the College of Natural Sciences. Classes visited the campus each semester over the years and were treated to exciting lessons in chemistry, physics, geology, and biology that were not necessarily related to their classroom curriculum. Student groups gave demonstrations and provided tours of the vertebrate museum and the tropical and desert greenhouses. Chico State faculty visited classrooms and sponsored students as adopted scientists in their classrooms for the entire semester.

The catalyst to establish the Hands-on Laboratory as a model science teaching laboratory course for undergraduates on the Chico State campus was the result of a successful grant proposal written by Bev Marcum, professor of biological sciences, in 2002. The proposal, one of only two funded statewide, was for a Teacher Preparation Pathway grant from the California Science Project State Office that provided a one-time supplement to the Statewide Science Project’s work with practicing teachers.

Marcum said there is a great need and demand for science education outreach programs in Northern California because it’s a rural area with little access to facilities such as the Exploratorium, San Francisco’s Lawrence Hall of Science, or UC
Berkeley’s Museum of Paleontology. Combining the educational mission of the University with the outreach programs for its service area is the key to success.

Educating the Educators

“The Science Education Laboratory actually does triple duty,” said Marcum, who is also the director of the Science Project of Inland Northern California. She explains that the lab provides an empowering early teaching experience in science for undergraduates, an exciting, standards-based learning experience for elementary school students, and high-quality, ongoing professional development for area teachers through workshops and summer institutes specific to the standards-based science lessons taught in the lab.

“We are studying the effectiveness of the Science Education Laboratory experience for each of these three groups through ongoing research and evaluation of the programs,” said Marcum. Lab coordinator Tanya Heaston is a credentialed high school teacher who has just completed the Master's in Science Teaching (MIST) program at Chico State. The MIST program is part of the Master’s Degree in Interdisciplinary Studies within the School of Graduate, International, and Interdisciplinary Studies. Anne Stephens, a middle school teacher and environmental science education expert, is the instructor of record for the Hands-on Lab. Stephens received her Master's in Science Teaching from the MIST program and is taking a professional leave from the Chico Unified School District to help with curriculum development and instructional technology implementation in the Hands-on Lab program.

“It is extremely important to have these two teaching experts working with our undergraduates in the Hands-on Lab,” Marcum said. “Our undergraduates benefit tremendously from Heaston and Stephens’s classroom experiences, and the effectiveness of the class would be seriously diminished if they were not part of the instructional team.”

Creating Connections

The emphasis in the Hands-on Lab is on collecting evidence by measuring and doing experiments. “Doing science is a great way to practice critical thinking,” Marcum said. “We emphasize the role of the scientific method in reaching conclusions based on observations and experimental results.”

—Bev Marcum

The science lessons support state standards, and teachers have reported that the visits motivate them to do more science in the classroom. Pre- and post-visit activities serve to augment the classroom curriculum. These activities were developed by teachers who attended the many Hands-on Lab related professional development opportunities offered through the Science Project of Inland Northern California.

Many have played important roles in developing the Hands-on Lab, including faculty and administrators in the College of Natural Sciences and the Center for Mathematics and Science Education. Marcum commends university leaders for their foresight and support.

The Science Education Laboratory, a center for research in teaching and learning, is a flagship program for the California State University system and is an important program for high-quality science education.
Six Centers

CSU, Chico is home to six centers that provide services to the university campus, its surrounding service area and beyond. Campus centers are started by individual faculty or staff who see a need for multiple funded projects with the same focus. Once a project grows to the point where it requires support staff and a central space in which to work, it may request designation as a “center.” As part of acquiring that designation, plans must be prepared that address the expected impact on curriculum development and delivery, on unit resources, and on faculty professional development opportunities.

Archaeological Research Program

Dr. Greg White’s Archaeological Research Program (ARP) seeks contracts and grants for professional services in the resource management field. Responses come from an array of private and public agencies.

Dr. White’s program encompasses a variety of outdoor and laboratory investigations. Currently, ARP is excavating and documenting a prehistoric cave, investigating a Gold Rush town site, and studying the ancient environment and cultural uses of Lassen Volcanic National Park. White consults regularly with regional Native American tribes.

“Fulfilling the University’s commitment to regional tribes has brought great benefits to our program and the University,” White said. “These unique opportunities allow us to train students in a world where we all work together.”

White makes a place for both graduate and undergraduate students who are heavily involved in ARP projects. This experience provides students with valuable hands-on archaeological training and problem-oriented research. Recent graduates have quickly obtained career positions in private consulting and in public agencies throughout the Far West. “When they get good, they get going,” White said.

Center for Nutrition and Activity Promotion

Dr. Cindy Wolff’s research program gained regional presence with the recent establishment of the Center for Nutrition and Activity Promotion (CNAP). CNAP includes five funded programs: OPT for Fit Kids, Safe Schools, the Sierra Cascade Five-a-Day Campaign, StepFit Chico, and the Sierra Cascade Nutrition and Activity Consortium (SCNAO). These programs offer paid and unpaid service-learning positions for California State University, Chico undergraduate and graduate students.
“Center activities are multi-disciplinary,” said Wolff, “and feature 40 students from eight different departments each semester.” SCNAC, the largest of the programs, comprises 30 community and school partners in six North State counties. “SCNAC promotes strategies for increasing fruit and vegetable consumption and daily physical activity,” noted Wolff. “And it provides both the funding resources and training for rural communities to better meet the needs of their residents.”

SCNAC features such activities as Smart Bodies—Smart Minds, a library-based program that integrates nutrition education with children’s story books; Lunch Leagues, which sends university students to K-6 classes to provide lunchtime nutrition education in the cafeteria and to promote physical activity on the playground; and Treat for Trade, a holiday candy exchange that promotes school and community vegetable gardens.

CNAP’s programs are funded for a total of $1.8 million. Funders include the U.S. Department of Agriculture, the U.S. Department of Education, and Butte County First Five.

**Center for Economic Development/ SBDC Partnership**

The Center for Economic Development (CED), led by director Dan Ripke, helps Northern California communities plan and prepare for sustainable growth. Through economic studies, workshops, conferences, publications, and services, CED helps communities and businesses generate employment opportunities, manage natural resources, train leaders, develop their communities, and promote empowerment and expertise among their residents.

In addition, the CED is the recipient of a grant from the Small Business Development Administration (SBA) to be the Lead Small Business Development Center (SBDC) for the Sacramento region’s network of six local SBDC’s. The Lead SBDC provides services to strengthen the small business community network and promote economic growth within the 23 county service region in Northern California. The Lead SBDC and six SBDC’s provide counseling and training to all small business populations.

The CED publishes a wide variety of reports, studies, and presentations focused on Northern California, including its Annual County Economic and Demographic Profiles, now available for 23 counties.

**Geographical Information Center**

The Geographical Information Center (GIC) was established in 1988 to introduce digital mapping and geographical information systems (GIS) technology to the Northern California region. Because the GIC is affiliated with Chico State, it draws on expertise from the academic community and provides valuable on-the-job training and employment opportunities for campus students.

While GIC’s primary area of expertise is technology, staff also have extensive experience in global positioning systems, computer cartography, image processing, airphoto interpretation, and serving GIS data over the Web.

Employing from 10 to 20 individuals, the GIC has completed the following projects:

**The Sacramento River Recreation and Public Access Guide:** (cont. pg. 15)
This guide was conceived as a way to help the public find its way through the many jurisdictions that manage land along the Sacramento River. At the core of the Web site is a map linked to a database of recreation sites listing opportunities on public and private river lands: Central Valley Agricultural Atlas. The computer program for this Web atlas was developed as a user-friendly way to quickly compile county agricultural maps.

Arundo Mapping: The GIC was contracted to map locations of Tamarisk and Arundo donax as the first step to a CalFed eradication project of these invasive species. Parcel information overlays were used to determine ownership in an effort to facilitate an outreach program to landowners.

GIC director Chuck Nelson said, “With numerous research opportunities available throughout California, the growth of the GIC has resulted in a renewed university commitment to strengthen ties to the public and private sector of the state.”

Academic Technologies
ATEC/IMC

Academic Technology’s multifaceted IMC Productions is housed in CSU, Chico’s Meriam Library. For more than 20 years, IMC Productions has delivered creative and innovative high-quality media solutions to on- and off-campus clients. From billboards, radio, and TV spots to postcards, posters, and informational mailings, IMC has helped clients get the word out about their programs and expertise. For instance, every hospital emergency room and police station in California displays IMC’s powerful bilingual informational posters designed for victims of violent crime.

IMC Productions has also created hundreds of instructional, educational, and informational video programs over the years. Instructional video programs include those for college-level courses as well as program materials for government and public sector audiences.

Other services include scripted or unscripted documentaries, public service announcements and ad campaigns, CD/DVD development and distribution, and design and print services. IMC’s designers specialize in high-impact visual communication appropriate for logos, newsletters, magazines, posters, brochures, exhibits, or Web graphics.

Knowing that an agency’s reputation may rest on the quality of its Web site and its ability to deliver up-to-date information and services, the IMC has developed a range of services to support Web site development. These include Web design, Web course development and hosting, WebCT training, and Web casting.

‘High-quality’, ‘creative’, and ‘effective’ are terms our clients use to describe training, courses, materials and programs created by IMC Productions,” said Kathy Fernandes, director of Academic Technologies.
Center for Ecosystem Research

The purpose of the newly formed Center for Ecosystem Research (CER) is to enhance competitive research of ecosystems and their biological, physical, and chemical components. The objective is to facilitate collaboration among faculty to explore scientific questions together and work side-by-side sharing ideas, research space, and equipment.

“This arrangement enables collaboration among faculty actively participating in scientific research,” said Jennifer Rotnem, the director of CER. “In turn, we expect the benefits to be an increase in research activity, an increase in grant and contract competitiveness, and an improvement in our ability to respond to societal needs.”

CER will build a more cohesive organization while providing laboratory space for cross-campus research. Laboratory space and equipment that is currently administered by the College of Natural Science (NS) will be dedicated to research that promotes the goals of the center.

The college’s vision for the Center for Ecosystem Research is to build upon the successes of faculty and staff within environmental disciplines. The idea for CER emerged from the college’s focus on creating Centers of Excellence to provide the infrastructure for interdisciplinary education and research in the disciplines. NS already has one Center of Excellence, the Center for Math and Science Education.
Dr. Ron Hirschbein of the department of Philosophy is committed to the cause of peace and the academic pursuit of knowledge about peace and war. His most recent published book, *Massing the Tropes: The Metaphorical Construction of American Nuclear Strategy* deals with how the nuclear strategy of the United States has been explained to the American people. Dr. Hirschbein strives to involve numerous students in his research. In 2005, he organized a three-week program in Northern Ireland with 15 Chico State students. They worked to understand the roots of conflict and the successful peacemaking effort in a war-torn country.

Dr. Lisa Churchill from the Department of Professional Studies is an expert in the field of special education. She has published and presented extensively in her discipline and received numerous honors for the high-quality and innovative programs she and her colleagues design. Her outstanding presentations and publishing are complemented by her dedication to student recruitment. Along with her colleagues, Dr. Churchill has successfully secured $900,000 in grants and contracts to support the University’s Special Education Program and its teacher candidates. This funding primarily supports credential candidates who otherwise may not be able to pursue a teaching credential.

Dr. Xueli Zou of the Department of Physics has utilized her experiences as a two-time National Science Foundation research scholar to develop pedagogy for the introductory physics courses at the University. Dr. Zou has completed numerous peer-reviewed publications in *Physics Education Research* and has presented at numerous physics events nationwide. She was a reviewer, referee, and organizer for several publications and conferences and is the co-author of two textbooks. Hundreds of CSU, Chico engineering and physics students have benefited from her proven teaching methods that make it easier for students to grasp difficult physics concepts.

Associate Professor William M. Murphy of the Department of Geological and Environmental Sciences is a leading scientist in geochemistry. He has co-authored numerous articles with scientists at Ecole Normale Superieure in Paris, France, one of the leading research institutions and graduate programs in France. Among his many accomplishments, Dr. Murphy is internationally recognized as an expert in radioactive waste disposal. He serves as a judge for the U.S. Nuclear Regulatory Commission and works for the Commission on the Yucca Mountain Nuclear Waste Disposal program. Dr. Murphy includes undergraduate and graduate students in his work, recently publishing 15 abstracts, 10 involving other faculty or students as co-authors.

Dr. Byron Wolfe of the Department of Communication Design is a nationally recognized photographer whose work has been published in numerous magazines and books in the last three years. His photographs have appeared in publications such as the *Utne Reader*, *The New York Times* Science Section, and the *Orion Magazine*. Winning numerous awards, Professor Wolfe’s photographs also have been displayed at exhibitions across the country, including Duke University, The High Museum of Art in Atlanta, the Yale University Art Gallery, and the George Eastman House International Museum of Photography. Professor Wolfe directs the Annual Student Photography Show that exhibits the work of nearly 100 Chico State student photographers.
Jennifer Metherd and Dale Steiner have been involved with the North State History-Social Science Project since its inception in 1993. Under their leadership, the History Project has conducted annual summer institutes for teachers at the Chico State campus, and workshops and in-service programs throughout northeastern California. It has also formed long-term partnerships to help low performing schools in their ongoing efforts to raise student achievement. In the past year and a half, Jennifer Metherd and Dale Steiner have been awarded two federal Teaching American History grants. The first grant for $837,000 is with the Chico Unified School District and runs through 2007. The second works with the Glenn County Office of Education and is approximately $1 million.

Allan Bee is the director of the Educational Talent Search Program at Chico State. His previous work with Upward Bound prepared him well for this challenging position. The Educational Talent Search mission is to prepare and motivate low-income and first-generation students to succeed in postsecondary education. The program currently serves 900 students in grades 6 through 12 in 23 schools in our service area. The results make a difference to students and their families: of the Educational Talent Search class of 1999, 73 percent of the students have now attained a college degree or are currently enrolled to complete their degree.

While Jennifer Rotnem has directed environmental projects for the College of Natural Sciences for the past seven years, she has also worked with the Bidwell Environmental Institute, whose purpose is to promote and support campuswide environmental initiatives. Jennifer Rotnem is currently directing projects sponsored by California Dept. of Fish and Game and Bureau of Land Management. Other partners have included The Nature Conservancy, U.S. Forest Service, State Water Resources Board, and River Partners. Rotnem’s goals include creating environmentally literate citizens and helping the University become a leader of education for sustainable development.
Matthew Eltgroth of Chester, Calif., researched and wrote the University’s outstanding master’s thesis in 2005. What led him to this distinction brings one to appreciate his complete dedication to the sciences.

In 2001, Eltgroth began studying molecular microbial ecology under the tutelage of Dr. Gordon Wolfe. His resulting poster titled “Molecular characterization of microbial enrichment cultures from Big Chico Creek” received awards for Outstanding Poster for an undergraduate independent research project and Excellence in Microbiology Research at the 2002 Department of Biological Sciences Sixth Annual Student Research Poster Symposium.

Upon completing his BS, Eltgroth entered Chico State’s graduate program in biology and began studying the long-chain neutral lipids of the prymnesiophyte algae. His research in this area was presented at the 2005 meeting of the American Society of Limnology and Oceanography and was also published in the journal *Phycology*. In addition to his work studying algae, he spent time researching the genetics of plant defense pathways, all the while tutoring in classes such as zoology, microbiology, and genetics.

In 2005, Eltgroth graduated with distinction, receiving his master’s degree in biological sciences. His thesis, titled “Production and cellular localization of neutral long-chain lipids in the haptophyte algae Isochrysis galbana and Emiliana huxleyi,” addressed fundamental questions about how and where inside the cell these single-celled micro-organisms store the lipids that are deposited in marine sediments. These sediments have been used by geochemists to estimate oceanic temperatures from the geologic past, important in climate studies, as well in the production of aquaculture food stocks.

Upon graduation, Eltgroth was accepted to the UCSF School of Medicine. During the summer of 2006, he was a Dean’s Summer Research Fellow, under the mentoring of Dr. Tejal Desai. Their studies included using nanotubular titania in bone implants and the use of nanoporous membranes for encapsulating biologically-derived implant materials.
Two students from California State University, Chico took top honors at the 20th annual Student Research Competition in May 2006 at CSU, Channel Islands. Robert Abbott, a fall 2005 graduate in computer science took first place in the Undergraduate Engineering and Computer Science category. Sarah Horylev, a spring 2006 graduate with an MA in history, was runner-up in the Graduate Behavioral and Social Sciences category.

Titled “Context Driven Spell Checking,” Abbott’s entry received a $500 prize for his spell checker that detects typos and misspellings which result in actual words. “The spell checker is far from perfect but shows promise,” said Abbott. “Much of my effort was directed toward making it run on modern PC’s and determining appropriate thresholds for flagging errors so as to maximize the number of mistakes caught, while minimizing the number of correct words labeled as mistakes.”

Abbott graduated with a double major in mathematics and computer science. He is currently living in Virginia and working for Cubic Applications, Inc., a defense contractor. He plans to work on a new version of the program with Dr. Tyson Henry, his project advisor.


Horylev researched newspaper articles and government documents, including reports written by Congressional delegations to Central America and Negroponte’s confirmation hearings for U.S. representative to the United Nations in 2001, ambassador to Iraq in 2004, and for director of national intelligence in 2005. She also accessed the National Security Archive’s Web site to look over 400 cables and memos that Negroponte wrote to members of the State Department, CIA, and National Security Council during his ambassadorship.

Horylev concluded that Negroponte played a very active role in the United States attempts to destabilize the Sandinista government. The study revealed that Negroponte was responsible for securing the Honduran governments continued support for the contra war.

Horylev is planning to take a year off to travel in Central America before returning to the University to get her teaching credential. Her goal is to teach U.S. history to high school students.

The Office of Research and Sponsored Programs
serves the campus community, especially faculty, with a high level of support and assistance in securing and managing externally funded projects. Through its work with faculty researchers, the Office of Research and Sponsored Programs supports scholarship and creative activity across the university. Faculty participation in funded research informs instruction, allowing students to benefit from enriched learning environments.