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On the cover:

Montana State University–1893
Roberts Hall Final Construction–1922
Engineering and Physical Sciences Building–1997
Cobleigh Hall–1970
A TRADITION OF PROGRESS: PAST AND FUTURE

The document before you is symbolic of many subtle but significant changes ongoing within the College of Engineering at MSU. We are embarking upon a new era in which we fully recognize the positive impacts of our College to a wide group of constituents within the state, nationally and internationally. More importantly, we are striving to achieve even greater heights while maintaining accountability to all these constituents. Therefore, this report represents an attempt to disseminate valuable information to a broad range of our friends and supporters in a summative fashion.

Contained within these pages are highlights of programs, faculty and student achievement, and other special initiatives that I believe help demonstrate why the College of Engineering played a major role in recent accolades heaped upon MSU. Money magazine also recently ranked MSU as a "Best Buy" among top-rated schools in 12 western states (one of only two outside California). So we think it's time to begin spreading the word about the growing legacy of discovery, innovation, learning and service that epitomizes our College. And of course, we want to leave no doubt in the minds of Montanans that the College is an extra-ordinary investment in terms of the technological and economic well-being of the state.

Our theme for this inaugural report emphasizes our long history of excellence in addition to new and exciting initiatives. I believe you will enjoy reading about events in each department, research and service initiatives, with a mix of other notable recent student and faculty achievements. I think you will see why I have always believed that MSU and the College of Engineering represent the "best of both worlds." We have a superb faculty engaged in leading edge research in state-of-the-art facilities and an outstanding student body; both rival that of any major university. Yet, our faculty are dedicated to maintaining the highest possible quality in our baccalaureate programs, and they all take pride in the teaching of undergraduate students and even engaging these students in their research—a feature touted by fine small colleges but lost at larger universities. We feel proud to serve in this important niche.

In the months and years to come we shall "refocus" upon our mission as a major unit within a land-grant university. We are dedicated to providing a superior, highly technical work force to Montana and the nation for the purpose of building a stronger economy and, of course, a stronger quality of life as a result. Whether related to infrastructure needs, environmental measurement and quality, biomedical developments, computing and telecommunications, value-added processing of commodities, leading edge energy research, or even security technologies, the College of Engineering is poised to play a major contributing role in Montana and on the national stage.

It is indeed a terrific honor to be in a position to help lead this great college now into its third century. So, I hope you enjoy this publication and please feel free to contact me and let me know what you think about any aspect of the College.

Robert J. Marley, Ph.D.
Dean

Robert Marley, Dean

College Mission
The College of Engineering will serve the State of Montana and the nation by...
• Supporting student achievement
• Integrating learning and discovery
• Developing and sharing technical expertise

College Vision
We will be the college of choice for those seeking a learning experience that fosters innovation, discovery, and the opportunity to apply technical knowledge for improving quality of life and economic prosperity in Montana and beyond.
In 2001, the College of Engineering made concerted efforts to expand its emphasis on research and graduate education. Tasked with expanding the graduate program and fostering research opportunities for faculty and staff, Dr. Anne Camper was appointed as the Associate Dean for Research and Graduate Studies.

Research programs, relevant to technological progress and economic development, continue to grow within the COE creating a balanced mix of cutting edge research and applied projects. Federal agencies, the State of Montana, and private industry sponsor research and projects. Industrial sponsors range from Fortune 500 companies to small Montana companies.

Projects are performed by single faculty members, between faculty members within the COE and others across campus and at different universities, and at the three major research/outreach entities in the College including: Center for Biofilm Engineering, Western Transportation Institute, and Montana Manufacturing Extension Center (pages 10, 10, and 11 respectively). These centers benefit from extensive collaboration with faculty members from various departments within the COE. This results in research funds being channeled through centers from individual faculty members.

New endeavors with historical relevance are continually emerging. For example, faculty in the COE will participate with faculty in the Department of Physics and Department of Chemistry at MSU in a new $1 million initiative on electrochemical energy funded through the National Energy Research Laboratory (NETL) and Pacific Northwest National Laboratory (PNNL). This interdisciplinary project includes fuel cell technologies, power conversion, and research on other infrastructure necessary for the deployment of innovative power technologies in rural areas. Educational activities through shared courses and distance learning opportunities with NETL and PNNL are planned.

Research Promotes Excellence in Undergraduate Education

The COE provides excellent opportunities for undergraduates to participate in research. Undergrads from all departments are involved in research projects through groups such as the Center for Biofilm Engineering and Western Transportation Institute. These projects are often long-term and result in undergraduates as authors on peer-reviewed publications. Undergraduates with involvement in research also develop exceptional teamwork and communication skills. Certainly, these students are actively recruited by graduate schools, industry and government agencies upon graduation.

Key graduate program enhancements this year include the Ph.D. in Computer Science recently approved by the Montana Board of Regents. The Ph.D. in Engineering now includes options in Applied Mechanics, Chemical Engineering, Civil Engineering, Electrical & Computer Engineering, Environmental Engineering, Industrial Engineering, and Mechanical Engineering. This diversity permits each student to target his or her area of expertise and to develop a focused program of study. Additional attention has been paid to the needs of students interested in pursuing the M.S. as a terminal degree.

Research Overview
Fiscal Year 2001-02
(1) Graduate Students
Department MS PhD
ChemE 12 5
Civil 38 5
Comp Sci 36 3
ECE 17 6
MIE 32 1

(2) Grants and Contracts activities
Dean’s Office $71,567
Chem E $263,158
Civil Eng $4,134,263
(Includes WTI)
Comp Sci $114,245
ECE $627,708
MIE $1,382,856
(Include
MMEC)
CBE* $2,701,308
COE TOTAL $9,295,105
* All COE departments contribute to research through the CBE.

Stainless Steel ring used in College’s “Order of the Engineer” Ceremony
ENGINEERING PROGRAMS

The Montana State University College of Engineering offers nine undergraduate degree programs and options. With 2,100 undergraduate students, the college is one of the largest professional schools in the western United States. Typical students recruited to the COE come from the top third of their high school classes and have high average ACT/SAT entrance scores.

The college’s excellent reputation draws expert faculty from the United States and around the world. Over 98% of faculty members are tenured Ph.D.’s. Every member of the COE faculty is expected to teach engineering or computer science courses at the undergraduate level. The college maintains a student to faculty ratio of 15:1. Faculty members in every discipline impart knowledge and challenge students to be critical thinkers and problem solvers.

Engineering students enjoy outstanding opportunities to expand their education beyond the classroom with hands-on experience in our world-class research centers, faculty-directed research projects, and through cooperative education and industry internship programs. The college encourages students to gain professional experience to compliment and enhance their academic studies. The College’s excellent relationships with regional and national companies help broaden student opportunities.

Student Advocacy and Diversity

The College of Engineering is committed to serving students while promoting diversity. To achieve that goal, the COE created a new position of Assistant to the Dean for Undergraduate Programs and Diversity in 2001. This year, the college has a renewed emphasis on retaining engineering students and helping them achieve their fullest academic potential through early intervention and enhanced advising. Enhancing college-wide diversity initiatives is an equally important strategic goal; equal access to the college and its support programs for all students is a priority. The college’s Engineering Minorities Program (EMPower) includes enrichment programs for pre-college students, retention programs and support networks for under-represented minorities, particularly Native Americans and women.

Engineering Enrollment

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Year</th>
<th>Minority</th>
<th>White</th>
<th>Unknown</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>97-98</td>
<td>76</td>
<td>(3.7%)</td>
<td>1,665</td>
<td>168</td>
<td>135</td>
</tr>
<tr>
<td>98-99</td>
<td>77</td>
<td>(3.6%)</td>
<td>1,761</td>
<td>189</td>
<td>137</td>
</tr>
<tr>
<td>99-00</td>
<td>80</td>
<td>(3.6%)</td>
<td>1,825</td>
<td>176</td>
<td>135</td>
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<tr>
<td>00-01</td>
<td>72</td>
<td>(3.2%)</td>
<td>1,910</td>
<td>158</td>
<td>102</td>
</tr>
<tr>
<td>01-02</td>
<td>66</td>
<td>(2.9%)</td>
<td>1,971</td>
<td>145</td>
<td>88</td>
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</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Year</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
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<tr>
<td>97-98</td>
<td>265</td>
<td>(13.0%)</td>
<td>1,779</td>
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<tr>
<td>98-99</td>
<td>293</td>
<td>(13.5%)</td>
<td>1,871</td>
</tr>
<tr>
<td>99-00</td>
<td>328</td>
<td>(14.8%)</td>
<td>1,888</td>
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<tr>
<td>00-01</td>
<td>341</td>
<td>(15.2%)</td>
<td>1,901</td>
</tr>
<tr>
<td>01-02</td>
<td>329</td>
<td>(14.5%)</td>
<td>1,941</td>
</tr>
</tbody>
</table>

Student organizations collaborate.

“Conoco supports the College Minority Program because it ties to our own corporate diversity objectives. As a company, we support new ways to partner with the college in enhancing diversity-related outreach.”

Linda Thompson, ConocoPhillips Inc.
The Department of Chemical Engineering continues to provide opportunities for students through innovative curriculum changes, opportunities for involvement in research at both the undergraduate and graduate levels, and design groups studying unique processes that provide a service to Montana's communities and citizens.

In 2000-01 we added four Focus Areas to our program: Classic Chemical (Process) Engineering, Materials Engineering, Bioengineering, and Environmental Engineering. While all chemical engineering students continue to take the same core of essential chemical engineering courses, they may now focus their engineering electives in an area of specific interest. The new curriculum has been well received by both faculty and students.

The Department seeks to provide opportunities for professional development of our students through excellent research opportunities and industrial practice. We work with industrial colleagues and alumni to maintain industrial internship opportunities, both during summers, and for our cooperative education program.

Undergraduate research opportunities remain a strong emphasis within the department, and we encourage students to undertake projects across the campus. In our own labs, students perform research in composite materials, environmental engineering, and chemical engineering processes. Other students work with researchers in the Center for Biofilm Engineering, Chemistry and Microbiology. Their research topics include bioremediation of heavy metals, effectiveness of antibiotics against infections, biobarriers to control pollution, and reactions of hyperthermal oxygen ions at the MSU Molecular Beam Facility. We have seen tremendous results from involving outstanding students in research, including four Goldwater Scholarship winners in recent years.

Faculty Highlights

The Department continues to have an active and creative faculty. Dr. Joe Seymour (PhD, UC-Davis) joined our faculty last fall, and brings energy and enthusiasm to both his teaching (Transport Phenomena) and research (Magnetic Resonance Imaging). Students already appreciate his obvious commitment to their education, and some are getting involved in his research efforts as well.

Dr. Phil Stewart is the principle investigator for a Keck grant in the Center for Biofilm Engineering. This grant is specifically designed to bring together PhD candidates from various disciplines to form an interdisciplinary team to investigate bacterial biofilm formation as a coordinated multi-cellular process. The project is aimed at developing a comprehensive view of how sessile microorganisms work together.

Dan Shaffer led a senior design group last year in which the students examined the septage problem facing many Montana counties. The issue is how to handle and dispose of the collected waste from individual septic tanks as new land restrictions and regulations make old methods infeasible. The group examined a potential solution: an Autothermophilic Digestion System. The students presented their design and economic results to the Gallatin County Commission, the Gallatin County Water Board, and State Health and Water Boards for consideration as a possible solution to this increasingly difficult problem.
The Civil Engineering (CE) Department continues to be an excellent career choice for students. Students can earn a Bachelor of Science in Civil Engineering degree with one of two accredited options. First, the traditional civil option covers many sub-disciplines of civil engineering including engineering mechanics and structural, geotechnical, water resources, transportation, environmental, and surveying engineering. With the bio-resources option, student coursework is more focused on land reclamation, soil and water remediation, hydraulic and hydrological design, environmental impact and assessment, and natural resource management. The department is also the home of the Construction Engineering Technology program. Emphasis here is on current construction applications, surveying, maximizing production, estimating, scheduling, quality control, safety, testing, and field analysis.

The nationally recognized Western Transportation Institute (WTI, see page 10) has been affiliated with the department since its inception in 1994 and the Montana Local Technical Assistance Program (LTAP, page 11) also is housed in civil engineering. In addition, civil engineering faculty have strong research ties to the college’s Center for Biofilm Engineering (CBE, page 10).

Civil Engineering’s strong ties to industry and corporations extend far beyond the Rocky Mountain region. Program supporters from both the civil design and construction fields sponsor internships, research, and creative activities within the department. The department’s internship program is among the strongest at the university, and provides students internship opportunities throughout fall, winter and summer. "Our intern program greatly benefits all parties," explains new CE Dept. Head, Brett Gunnink. "We are proud that students and industry are equally well served by this program." Those companies who have participated in the CE internship program return year after year and the department also enjoys a steady stream of new internship sponsors. The 12 week program gives both sides the opportunity to assure a good match between a student’s strengths and corporate objectives.

Departmental options for graduate students are now more diverse than ever. Doctoral students in CE may pursue a Ph.D. in engineering with either a civil engineering option, an environmental engineering option, or an applied mechanics option. Undergraduate students wishing to pursue specialized graduate degrees in structural or environmental engineering or construction engineering and management are able to complete both bachelors and masters degrees within five years.

The department is home to one of the strongest and most recognized Institute of Transportation Engineers (ITE) student chapters in the nation. For three out of the last four years, MSU’s student chapter has been recognized as outstanding, based on students’ technical activities, professional interaction and involvement, public service, outreach, and promotion of the profession among peers. Other outstanding student organizations include the American Society of Civil Engineers (ASCE), Associated General Contractors (AGC), Bio-Resources Engineering (BREN), Chi Epsilon, Montana Association of Registered Land Surveyors, and Sigma Lambda Chi.

"From our founder to our most recent hire, we've built our practice around MSU Civil Engineering graduates. While consistently prepared with a rigorous theoretical foundation, they are always balanced with practical know-how and a strong work ethic."

Michael P. Sanderson, MBA, P.E., Engineering, Inc., Billings MT
Excellent industry relationships and the career successes achieved by students continue to make the Computer Science program a top choice for students in the Rocky Mountain West. The department is accredited by the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET). Presently only 10% of the computer science programs in the country are fully accredited.

The college's computer scientists and software engineers are in high demand for internships and full-time employment. Job opportunities for computer science graduates are unmatched by other engineering or science disciplines and high salary offers are often accompanied by significant signing bonuses. MSU is designated as a key school for Computer Science students by Hewlett-Packard's VLSI division, Tektronix, Inc., and Micron Technology.

During the past decade, computer science enrollment has grown significantly. Its 71.5% enrollment growth surpasses the healthy growth rates of the college's traditional engineering curricula. Enrollment peaked in 2001 at 350 undergraduate and 45 graduate students. This year the department launched a new PhD program in Computer Science. It now offers BS, MS, and PhD degrees.

The department plays a significant role in economic development in the region. Gallatin Valley Development Corporation estimates there are over 1000 Information Technology-related jobs in the region and CS graduates fill the majority of professional IT jobs in the region.

The department's 11 faculty members have active research and consulting expertise, in addition to teaching and advising. Recent successes in collaborative interdisciplinary research include funded projects in partnership with the Idaho National Engineering and Environmental Lab, MSU's Department of Cell Biology and Neuroscience, the Departments of Agriculture in five states, and MSU's Center for Biofilm Engineering and the Western Transportation Institute.

Located in the College of Engineering's new Engineering/Physical Science Building on the south side of campus, departmental facilities are excellent. Instructional computing labs are well equipped with high-speed network access. The EPS building is saturation wired for 100 megabit networking, and utilizes campus Internet 2 connections.

"The program is advancing science and technology education in a significant way and their best and brightest are well prepared to contribute to the semiconductor industry."

Dan Spangler, Micron Technology, Inc.

Valerie Wagner

CS graduate student, Valerie Wagner, is a Montana native who married a third generation MSU alumnus. As an undergraduate, Valerie studied chemistry at MSU earning both Presidential and Goldwater scholarships and graduating with highest honors in 1998. Valerie is also an avid skier and a classical pianist. She continued her education at Harvard Graduate School of Arts and Sciences where she studied chemistry. Wagner recently returned to MSU to study for her master’s degree in computer science. As a “non-traditional” CS master’s student, she will complete the degree in two and a half years. Valerie has interned with SRI International’s satellite office in Helena, Montana, working on speech recognition software projects for PDA applications. She will complete her degree in December 2002. A student leader and role model, Valerie has also served as the president of Association for Women in Computing, one of only six student chapters in the nation.
The Electrical and Computer Engineering Department experienced a milestone year marked by important events and significant progress in programs and research. Marking the high note for the year, a private donor established the largest endowment in the history of university to support ECE programs and students. Continued industry support, new ABET accreditation of the Computer Engineering program, several important new faculty hires, and a strong accumulation of research grants rounded out the year.

The Computer Engineering undergraduate degree program, begun four years ago, earned a new ABET accreditation following an on-site evaluation in October 2000. This accreditation applies to all Computer Engineering graduates since the fall of 1999. Computer Engineering enrollment continues to grow.

Excellent ties to industry enhance recruiting relationships, donations of new equipment, and laboratory upgrades. For example, Tektronix, Inc., based in Beaverton, Oregon, donates equipment and sponsors the Tektronix Design Project, which emphasizes interdisciplinary teamwork. Seven students participated in the Tektronix oscilloscope probe project, including three students from Electrical and Computer Engineering, and four from the Mechanical and Industrial Engineering departments. Laboratory equipment donated by Tektronix is used extensively in our Circuits Lab and Controls Lab. The newly expanded Digital Systems Lab accommodates more students, while utilizing computers donated from Tektronix one-year prior.

Research grants include award notifications from National Science Foundation (NSF), NASA-EPSCoR, Photuris Corporation, NIH, Los Alamos National Laboratory, and state funding. Research expenditures totaled $523,000 from 16 active research projects, including three from private sources, four from state funding, and nine from federal agencies.

Shaw Leads Arctic Research Team

EE Associate Professor, Dr. Joseph Shaw, is a member of an international team from the U.S. and Japan developing remote sensing instruments and using them to study the Arctic atmosphere in Alaska. Shaw serves the research team as an expert in infrared optical techniques for measuring the effect of atmospheric water vapor and clouds on the delicately balanced Arctic climate. Dr. Shaw’s team recently developed a new Infrared Cloud Imager (ICI) to measure the cloud characteristics in the Arctic atmosphere.

The project is led by the Applied Research Division of the Communications Research Laboratory (CRL) in Tokyo, Japan with the University of Alaska-Fairbanks and individual investigators from other participating institutions. Climatologists suggest that such arctic research is critical because these high latitude settings often reveal early signals of global warming. There is also interest in determining if anthropogenic chemicals are creating an ozone hole over the Arctic, such as has been identified over the Antarctic.
MECHANICAL AND INDUSTRIAL ENGINEERING

The M&IE Department houses Industrial & Management Engineering (IME), Mechanical Engineering (ME), and Mechanical Engineering Technology (MET). Dedicated faculty, facilities and solid industry relationships enable successful students to compete anywhere in the United States and beyond. The undergraduate programs (IME, ME, and MET) are all fully ABET accredited.

Students benefit from first-rate faculty, who are on the cutting edge of research in their fields and excel at classroom teaching. For example, the research and creative activities of the faculty continue to grow, with externally funded grant and contract activity for the current year 37% higher than the previous year. This substantial increase is a direct indicator of the quality and dedication of the faculty. Examples of specific projects include work in materials science, composite materials, combustion, engineering design, project and program management, and air conditioning/heating systems.

MSU mechanical engineering students earned national honors in the prestigious ASME National Design Competition. Within the past two years, student teams from Mechanical Engineering and Mechanical Engineering Technology earned first and second places respectively. This is a significant achievement given the caliber of schools against which our students compete. Students designed and built a “Mars robot” able to negotiate an obstacle course and a “pop bottle-filling machine”.

The department listens and responds to student input and suggestions on creating the most effective learning environment. At the recommendation of the department’s industrial advisory board and students, the department opened a student shop. Students now have a place to “build” and work on projects, while they benefit from faculty interaction to assist with senior design projects, student design competitions, and graduate student research projects.

The IME program is undergoing changes in faculty due to the recent retirement of long-term faculty members, yet the commitment to excellence continues. Quality faculty has been and will continue to be the core of the IME program.

Teacher and Researcher: Sobek–NSF Career Award Recipient

Four years ago, Durward Sobek joined the IME faculty. Dr. Sobek is a Montana native who received his BS from Dartmouth, and the MS and Ph.D. degrees from The University of Michigan. Sobek was hired with two primary responsibilities: contribute to the excellence in the undergraduate IME program by becoming an outstanding teacher and student mentor, and contribute to the growth in the IME research and graduate programs by becoming an outstanding researcher and graduate student mentor. He has exceeded both of these expectations. Sobek was recognized as an important young scholar by the National Science Foundation and received an NSF CAREER grant. In addition, he has been the recipient of in excess of $750,000 worth of research funding in the short time that he has been with MSU. He is an outstanding educator, working with students continually outside the classroom and contributing greatly to the modernization of the IME curricula.
Today, more cadets are enrolled in COE departments and programs than any other curricula at Montana State; 48 percent of cadets are currently enrolled in the College of Engineering. In 2001, MSU’s Air Force ROTC Detachment had its largest incoming freshman class and largest group of cadets in the past 10 years. A major emphasis for MSU’s Air Force cadet corps is scholastic excellence and over 80 percent of the cadets received scholarship support in 2001. Of all cadets participating in the Field Training Summer Leadership Program after their sophomore year, 60 percent brought home awards. For the fourth year in a row, all cadets who applied to be classified as pilots or navigators earned their chosen selection. For the third year in a row, all cadets who applied for in-college scholarships received awards. Detachment 450’s cadet corps includes almost 25 percent women, students of African-American, Asian-Pacific Islander and Native American heritage. Detachment 450 supports MSU and serves the surrounding communities with color guard presentations, rifle drill team performances, and by supporting community activities such as Bowl For Kids Sake, Adopt A Highway Clean-Up, Home Coming Madness, and Veterans Day activities.

**ROTC Partners to Enhance Flight Training for Cadets**

This year, in an unprecedented partnership among ROTC units, retired military in the state, and other pilots in and around Montana, new opportunities were afforded to cadets to pursue their aspirations of flight. The Montana chapter of the Daedalians, a military pilots’ organization, worked actively with Air Force ROTC to raise funds to offer flight scholarships to worthy cadets. These scholarships pay for both ground school and flight instruction sufficient for each cadet to earn a private pilot’s license.

Montana State University Army ROTC Bobcat Battalion offers students world-class leadership training to supplement their chosen academic field of study. Army ROTC Bobcat Battalion commissions a solid core of graduating seniors each year; eighty percent of graduating cadets have attended MSU on scholarships and will enter the Army as officers. The other twenty percent of ROTC students are pursuing college degrees after prior military service or simultaneously serving in the Montana National Guard. Army ROTC cadets also provide university service during games and activities and by supporting special campus events. In 2001, the cadets operated a rappelling and climbing wall and also participated in the annual university boxing event.

**MSU Cadets Bring Home Top Honors in Army Ranger Challenge**

MSU’s Army Ranger Team brought in first place honors from the Annual Regional Ranger Challenge. The competition consists of rigorous physical and weapons exercises, as well as land navigation and grenade assault activities. The men and women who helped bring home the honors had trained diligently and pushed themselves to the limits of their physical and mental capacities. Both male and female cadets performed at excellent levels. The Ranger Challenge begins with a physical training test, which focuses on pushups, sit-ups, and a 2-mile run. Three hundred is the targeted score for cadets taking the physical test. Cadet Leandra Viara scored a 369, breezing by the female standards and most of the male standards. She did 77 pushups, and 88 sit-ups, each in a two-minute time frame. It took her 13 minutes 35 seconds to complete her two-mile run. Also surpassing the 300 mark was Cadet Keelan McNulty who scored a 331, the top male score.
The Center for Biofilm Engineering (CBE) is one of only 36 National Science Foundation (NSF) Engineering Research Centers in the US, and the only such center in the Intermountain West. The CBE is considered to be the world’s leading center of research in the control of bacterial biofilms in natural and industrial ecosystems, and in chronic human infections. Researchers at the CBE investigate biofilm related phenomena in applications ranging from the bioremediation of contaminated groundwater and the efficient production of clean drinking water, to the control of microbially influenced corrosion and infections on medical devices. CBE research teams have also contributed to many of the recent advances in fundamental biofilm science and engineering. The CBE is structured to give students and faculty from various disciplines an opportunity to work together in contiguous laboratories to solve problems. CBE undergraduate and graduate students hone communication and collaborative skills, gain experience in interdisciplinary problem-solving, and interact with industrial representatives. Currently 23 companies support the center as “Industrial Partners,” including eight large companies in the pharmaceutical and medical device industries.

CBE graduated from direct NSF support in 2001, after receiving more than $18 million over an eleven-year period. Under the current funding model, the CBE runs interagency projects with funding from government agencies, private foundations, and industry. A new emphasis on the study of device-related and other chronic bacterial infections has attracted industrial associates in the medical area, and led to cooperative research with clinicians. Much of the previous NSF center support is replaced with NIH grants and medical industry contracts. Medical research support has enabled the CBE to transition to other funding sources, while maintaining research activities near $4 million per year.

As the MSU focal point for transportation research, the Western Transportation Institute (WTI) focuses on “making rural transportation safer, more efficient and more convenient across all modes of transportation through research, education and technology transfer.” Established in 1994 by the Montana and California Departments of Transportation, in cooperation with MSU, WTI focuses on rural transportation challenges and currently conducts research projects in 30 states. Located in the College of Engineering, WTI has an annual budget exceeding $6 million and employs a 65 person staff of students, professionals and associated faculty. WTI staff comes from engineering (mechanical/industrial/ civil), computer science, psychology, fish and wildlife, business, biology and economics.

During the past year, WTI concentrated on meeting the growing market demand for transportation professionals by providing students with “hands-on” research experience. Each year WTI contributes approximately $500,000 of U.S. Department of Transportation federal grants to support College of Engineering educational activities.

One innovative project focuses on winter weather reporting for travelers. WTI is developing a pavement temperature model for highways to place up-to-date road condition information on the web for travelers.

This model utilizes a National Weather Service forecast and a terrain/road elevation map for the area to predict ice and dangerous pavement temperatures.
Montana Manufacturing Extension Center (MMEC) is an outreach/technical center based out of the College of Engineering. The center utilizes consulting engineers in satellite offices throughout Montana to provide management and engineering services to manufacturers statewide. A primary focus is training Montana manufacturers in the latest manufacturing and engineering techniques.

Manufacturing represents 26% of the state’s economic base, and Montana manufacturers generate $5 billion in annual input while employing nearly 30,000 workers. MMEC has been credited with assisting manufacturers with creating 304 jobs in the past two years and saving manufacturers hundreds of thousands of dollars. MMEC funding comes from Montana tax dollars and fees from companies; these serve as a match for federal funding from the National Institute of Standards and Technology – Manufacturing Extension Partnership (NIST-MEP). The center consistently ranks at the highest levels of client satisfaction and returns $1.81 to the state in economic development for each $1 invested.

Training programs in “Lean Manufacturing” help manufacturers improve efficiency and save money. These tools have led to excellent results for companies like Nashville’s Gibson Guitar, Acoustic Division in Bozeman, Montana. Sixteen months into its “Lean” transformation, the guitar production facility in Bozeman was able to double its output, eliminating the need for a planned $2 million expansion. Production doubled and process time dropped from seven weeks to two. Scrap costs were cut in half, and significant capital was freed up by doubling inventory turns. The results of the “Lean” initiative for Gibson Guitar were staff promotions and a quarterly employee bonus.

Montana Local Technical Assistance Program (LTAP) helps local governments understand new technologies affecting transportation. The mission is: “To foster a safe, effective and environmentally sound roadway system by improving the skills, knowledge and understanding of local transportation providers and users through training, technical assistance and technology transfer.” Areas of emphasis include winter maintenance, safety information, equipment operations and traffic operations. In Montana, LTAP focuses on assisting state, county, and city departments with road and bridge maintenance by providing technical assistance. Principle funders for LTAP include the Federal Highway Administration, the Montana Department of Transportation and Montana State University.

LTAP provides referrals and shares information and solutions to transportation problems, and conducts local workshops such as winter maintenance, road construction, equipment operations and proper signing. LTAP maintains a lending library of videotapes and publications on transportation issues and publishes a quarterly newsletter for state, county and city departments with announcements of training opportunities and latest technological advances.

Engineering Experiment Station

The State Board of Education created the Engineering Experiment Station at Montana State University in 1924 to improve the economy, efficiency, and safety of engineering activity in Montana; to promote the conservation and utilization of Montana resources; and to encourage appropriate new industrial activities. Station funds are used to perform engineering research and outreach as part of the land-grant mission at Montana State University.

For innovative research projects, seed money is available through the Research Stimulation Program – Engineering (RSPE). These research projects are conducted by engineering faculty and often involve both...
graduate and undergraduate engineering students. The college utilizes these research programs to foster interdisciplinary education, which prepares students at all levels for employment in modern, team-based industries.

Examples of focused programs which are partially supported by Station funds include the Western Transportation Institute, which promotes the use of information technologies in rural transportation systems; the Local Technical Assistance Program, which disseminates technical information to local agencies in Montana for the improvement of transportation systems, and the Montana Manufacturing Extension Center University and Technical Assistance Program, which provides engineering, technical, and managerial assistance to Montana manufacturers. On a broader scale, the Engineering Experiment Station provided pivotal seed funding for the Center for Biofilm Engineering, which uses more than $4 million in federal and industrial funds to train over 90 graduate and undergraduate students in modern biotechnology.

Research performed by Engineering Experiment Station serves any industry in Montana that needs technical engineering study and solutions. The EES applies existing knowledge to the development of worthwhile products, develops the skills of the research faculty and materially improves the training of engineering students.

**Development**

Gifts from alumni across all engineering disciplines remarkably enriched the lives of COE students during 2001, with over $850,000 in scholarships awarded to engineering, computer science, and ROTC students. Alumni and friends also supported engineering and computer science departments and initiatives to improve facilities and upgrade equipment.

In 2001, an anonymous donor from the class of 1960 made a $100,000 challenge pledge to match gifts from first-time and “lapsed” donors to the college. He expanded his offer to match selected corporate gifts, as well. COE alumni from around the country and around the world responded enthusiastically and generously to this opportunity to leverage support of the COE. By the time the challenge is fulfilled, it will generate significant new gifts for the College of Engineering.

We extend a very special thank you to the college’s alumni, friends, corporations and foundations whose support shapes the COE today and tomorrow and whose generosity helps assure that the college provides the best engineering education in the United States. A special thanks to those individuals and corporations who have established named scholarships (individual, corporate, memorial, honorary) and program funds that provide expanded opportunities for future engineers and computer scientists.

**Annual Fund Gifts to COE in 2001**

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Donors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonathon Gifts</td>
<td>$98,844</td>
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<tr>
<td>Direct Mail Campaign Gifts</td>
<td>$162,082</td>
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<tr>
<td>On-Line Giving</td>
<td>$1,675</td>
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</tr>
<tr>
<td>Other Employee/COE Retiree Gifts</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$298,617</strong></td>
<td><strong>1,672 donors</strong></td>
</tr>
</tbody>
</table>
Founded in 1893

Degree Programs
Offering nine undergraduate degree programs and options we are one of the largest Professional Schools in the Western United States, having the largest array of Engineering and Computer Science programs in a five state region.

Faculty
We have a superb faculty engaged in leading edge research in excellent facilities with a personal commitment to teaching. 90% of our students are undergraduates. 98% of our faculty is tenure track with PhDs and they teach undergraduate courses. COE maintains a 15:1 Student/Faculty ratio.

FE Results
• 95% Pass rate – compared to 83% nationwide
• 92% pass rate over the last decade (Currently all engineering students are required to take the FE Exam.)

Degree Programs
• Chemical Engineering (BS, MS, PhD)
• Civil Engineering (BS, MS, PhD)
• Computer Engineering (BS, PhD)
• Electrical Engineering (BS, MS, PhD)
• Industrial & Management Engineering (BS, MS, PhD)
• Mechanical Engineering (BS, MS, PhD)
• Construction Engineering Technology (BS)
• Mechanical Engineering Technology (BS)
• Computer Science (BS, MS, PhD).

College Research Expenditures for Previous Five Years

*Drop in 2002 due to sunset of NSF-ERC monies in CBE
Office of the Dean
College of Engineering
M SU/Bozeman
Bozeman, MT 59717