

College of Engineering and Applied Science University of Colorado

**Semi-annual Report prepared 10/7/03 by
Robert H. Davis, Dean and Patten Professor**

Introduction

The College of Engineering and Applied Science (CEAS) at the University of Colorado at Boulder (CU–Boulder) is dedicated to Excellence in Education and Research. Student excellence will be achieved through active learning, including team projects, research experiences, service activities, and industry internships. Faculty excellence will be achieved through synergistic research and teaching, both in core areas of engineering and applied science and in multidisciplinary initiatives. In this Semi-annual Report, I highlight major advances made by the College in the past six months toward these goals and report on progress made on initiatives and recommendations discussed in previous meeting of the CU Engineering Advisory Council and Resource Development Committee.

New Faculty and Administrators

The College is pleased to welcome the following individuals to new faculty or administrative positions this fall:

John Zhai, Assistant Professor, Civil, Environmental and Architectural Engineering

Robert McLeod, Assistant Professor, Electrical and Computer Engineering

Chris Bowman, Chair, Chemical and Biological Engineering

Liz Bradley, Chair, Computer Science

Tom Lookabaugh, Faculty Director, Interdisciplinary Telecommunications Program

Development Staff

We are currently experiencing some turnover in our development staff. Terry Mayes resigned from the CU Foundation amidst a multitude of other cutbacks there in July 2003. Terry was Associate Director of Engineering Development and an important member of the development team for four years.

Development officer Kristin Germain subsequently was tapped by the College to fill a new position as Director of Outreach and Education, starting 10/13/03. We are pleased to have Kristin move into this new position to help meet our student recruitment and diversity goals, even though it creates another (short-term) vacancy on the development team.

A search to fill three positions in Engineering Development is currently under way. Marc Thompson said he hopes to have a full team on board by the end of the calendar year.

Major Events

On 5-8 November 2003, the College will host Frontiers in Education, the 33rd annual conference for innovators in engineering and computer science education, sponsored by ASEE and IEEE. This year's theme is "Engineering as a Human Endeavor: Partnering Community, Academia,

Government, and Industry.” The conference is expected to draw about 600 participants, including about 500 engineering educators and 100 industry representatives. Jim Avery and Melinda Picket-May, of Electrical and Computer Engineering, and Assistant Dean Jim Sherman are serving as general co-chairs. While much of the conference will be at the Westin Hotel in Westminster, the College will highlight its state-of-the-art facilities, the Integrated Teaching and Learning Laboratory (ITLL) and Discovery Learning Center (DLC), during a special reception.

Approximately 600 people from around the world attended the recent conference on “Sustainable Resources: Solutions to World Poverty,” co-sponsored by CU-Boulder, the Sustainable Village and Naropa University. The conference, which took place on campus during 1-4 October 2003, was coordinated by Bernard Amadei, a leader of the Earth Systems Engineering initiative in Civil, Environmental and Architectural Engineering and founder of the nonprofit Engineers Without Borders. Bernard plans to make the conference an annual event where engineers, entrepreneurs, volunteers and philanthropists can exchange practical and sustainable solutions to poverty around the world.

Faculty Awards

Kristi Anseth of Chemical and Biological Engineering has been selected to receive the Allan P. Colburn Award from the American Institute of Chemical Engineers at its November 2003 meeting, marking the second time in three years this prestigious award has gone to a CU professor. The award, which is given annually to the most outstanding chemical engineer under age 36, went to Chris Bowman in 2001.

Kaspar Willam of Civil, Environmental and Architectural Engineering received the Nathan M. Newmark Medal from the American Society of Civil Engineers. The Newmark Medal is among ASCE’s most prestigious awards and is presented to individuals who have made substantial contributions to strengthening the scientific base of structural engineering and solid mechanics.

Tim Brown, Associate Professor of Electrical and Computer Engineering and Interdisciplinary Telecommunications has been named Wireless Educator of the Year by the Global Wireless Education Consortium. He will be recognized at the annual Cellular Telecommunications and Internet Association conference in October 2003.

Frank Barnes of Electrical and Computer Engineering has been selected to receive the Education Society Achievement Award from the IEEE Education Society. The award, which recognizes his outstanding and sustained contributions to electromagnetics and telecommunications education, will be presented during the Frontiers in Education Conference hosted by the College in November 2003.

Roop Mahajan of Mechanical Engineering has been selected to receive the Charles Russ Richards Memorial Award for outstanding achievement in mechanical engineering from the American Society of Mechanical Engineers and Pi Tau Sigma. The award will be presented at the ASME meeting in November 2003.

Ken Gall of Mechanical Engineering has been appointed to the 2004-2005 Defense Sciences Study Group. This interdisciplinary group, sponsored by DARPA and the Institute for Defense Analyses, determines scientific and technological challenges in defense for the coming years.

Student Awards

A team of three undergraduates representing applied mathematics, computer science and electrical engineering earned the “Outstanding Winner” designation in last spring’s International Contest in Modeling sponsored by the Consortium for Mathematics and its Applications. The team was one of only 16 Outstanding Winners named among 638 teams participating in the contest, and is the third CU team to receive such recognition in the last four years.

Colorado Engineer Magazine, a CU engineering student publication since 1904, received 10 awards, including first-place “Magazine of the Year,” at the annual Engineering College Magazines Associated conference last spring. Planning is currently under way to celebrate CEM’s centennial with an art exhibit and alumni reception in spring 2004.

Vanessa Aponte, a doctoral student in Aerospace Engineering was one of 10 Hispanic Ph.D. students from all over the country featured in the August issue of the Society of Hispanic Professional Engineers Magazine. Vanessa, who hopes one day to become an astronaut, is developing a novel bio-MEMS sensor concept for monitoring an astronaut's immune system during space flight. David Klaus is her thesis advisor.

Andrew Azman, a BS/MS student in Environmental Engineering, received the David Brower Youth Award from the Earth Island Institute in September 2003 for his work on converting the CU Buff Bus fleet to biodiesel. The award is given annually to six of the nation’s most successful young environmentalists. Andrew developed a biodiesel processor two years ago in the College’s Engineering Projects course, and went on to form a student group and work with campus administrators to convert campus buses to the cleaner burning fuel.

Outreach Highlights

The College continued its range of K-12 outreach programs last summer, including the 36th annual High School Honors Institute for high-achieving high school juniors and seniors, the sixth annual Success Institute for underrepresented students in engineering, and numerous workshops for K-12 students and teachers coordinated by the ITLL.

The ITLL workshops were able to reach a broader audience this year by going off campus to sponsor workshops at Sanchez Elementary School in Lafayette and in Grand Junction at the Western Colorado Math and Science Center. Two CU engineering students also spent the summer assisting the Grand Junction staff in working with K-12 students. The ITLL’s second annual Girls Embrace Technology internship program also reached students from a wider geographical area due to alliances built with various community organizations after the program’s first successful year. Thirty-six girls from Longmont to Aurora came to campus for the six-week internship.

Other efforts under way include the ITLL’s development of a web-based digital library of K-12 engineering curricula (described in last spring’s report) and work by Jackie Sullivan to form a K-12 Division of ASEE. As previously mentioned, the College also has hired Kristin Germain to coordinate college outreach to K-12 students and teachers.

Other Noteworthy Items

The College’s undergraduate engineering program was ranked 17th in the nation among public engineering programs where the highest degree offered is a doctorate in the September 2003

rankings by U.S. News & World Report. The college was ranked 29th in the nation overall in a tie with UC-Davis, Harvard, Columbia University and the University of Southern California. These data compare to rankings of 19th among public engineering schools and 31st overall last year. The Aerospace Engineering Sciences program was ranked ninth among public schools offering specialty programs in aerospace engineering, and 13th in the nation overall.

The College and the Division of Continuing Education formally launched the new Center for Advanced Engineering and Technology Education (CAETE) in July 2003. The Center will continue the College's current master's degree programs in Interdisciplinary Telecommunications and Engineering Management, serving students both on and off the campus. The center, which also incorporates the CATECS distance-learning program, is expected to improve accessibility for part-time and non-degree students, while developing new certificate programs and short courses of interest to professional engineers.

Updates from April 2003 Student Reports

Society of Automotive Engineers

The Society of Automotive Engineers at the University of Colorado at Boulder offers students the chance to take part in the world of engineering through their formula SAE team, named "Buffalo Racing". The goal of the Buffalo Racing team is to allow students to combine theory from class with engineering and business skills to fund, design, build and test a formula-style racecar for the annual Society of Automotive Engineers' design competition. For the competition, students assume that a manufacturing firm has engaged them to produce a prototype car directed toward the entry level, weekend autocross racer. The design is judged based upon design quality, handling, performance, fuel efficiency, endurance, presentation and budgeting. In May 2003, the Buffalo Racing team placed 41st out of 125 competing schools from the United States, Canada, Mexico, Europe and Asia.

The students are gearing up for the 2004 competition by raising funds to begin developing and building this year's car. On 9/14/03, the students hosted the Seventh Annual Buffalo Racing Car Show at CU-Boulder. The turnout was excellent, with cars ranging from Vintage Cobras, Subarus, a Lamborghini, tricked-out trucks and huge Jeeps. This event garnered an evening spot on Fox 31 News. The students continue to meet with national and local organizations and companies to secure sponsorship for the project.

Engineering for Developing Communities and Engineers Without Borders

The overall mission of the Engineering for Developing Communities (EDC) program is to educate globally responsible students who can offer sustainable and appropriate technology solutions to the endemic problems faced by developing communities worldwide, including the United States. The EDC program works in collaboration with 1) universities, technical schools, vocational schools, and individuals in the US and in developing communities; 2) engineering companies; 3) humanitarian organizations; 4) non-governmental organizations; and 5) interested individuals. The Engineering for Developing Communities program is a new educational, research and outreach program that is part of the College's Earth Systems Engineering initiative. The outreach and service component of the EDC program is underway and embodied in the student chapter of Engineers Without Borders.

The charter student chapter of Engineers Without Borders (EWB) was established at the University of Colorado in 2001 by Professor Bernard Amadei. Since then, over 47 student chapters across the US have been chartered. EWB's founding vision is to provide project

coordination, funding, supervision, documentation and organization that link university engineering schools with project opportunities, primarily in the developing world. Over the past three years, CU students have participated in engineering projects in nine foreign countries and three US communities. During the academic year of 2002-03, 32 students actively participated in international engineering projects sponsored by EWB-USA. During Summer 2003, more than 50 students from various US schools were involved in EWB-USA projects in Mali, Mauritania, Senegal, Thailand, Haiti, Belize, Nicaragua, Afghanistan, and Peru.

Intellectual Property and Technology Transfer

Intellectual property generated from faculty research, in terms of innovations or developments, can in many cases be patented, especially if the research addresses manufacturing or specific design processes. The College, campus and University strongly encourage faculty to aggressively pursue licensing of intellectual property generated from research, which in turn will serve the faculty, students, the home unit of the individual faculty members, as well as the University. While the campus Technology Transfer Office works with individual faculty to pursue licensing and commercialization of newly developed research products, the College believes that we should be more proactive and work with faculty while the research is still underway, even in its initial stages, rather than waiting until the laboratory or analytical work has been concluded and journal papers are drafted. At the prior EAC meeting it was agreed that we should devise a mechanism where a team of EAC and other members, who work in the area of intellectual property development, will assist in prescreening proposed and ongoing research with the aim to determining what topics or potential innovations may have commercial potential. The Associate Dean for Research will distribute research summaries or abstracts of relevant projects, for review by the team. Following the early phases of research and IP-prospective, it is envisioned that the team members will work with or advise campus TTO & IP personnel on the feasibility or commercialization potential of college research products. We expect to start this process this fall and report on progress at the EAC meeting next spring.

Discovery Learning Center

The DLC has been open for nearly a year. While it is not yet used to its full potential, a strategic plan has been developed to increase the activity in the DLC and fulfill the original vision. The primary strategic objective of the plan is:

Build the DLC into a strong, vibrant Learning Center, externally recognized for its uniqueness, conducting vertically integrated interdisciplinary research, driven and supported by external sponsors.

This plan, along with a report by Assistant Dean JoAnn Zelasko that summarizes DLC use, is attached. In addition, the *Strategic Plan for Excellence* for the College as a whole has establishment of the *Discovery Learning Initiative* and increased involvement of undergraduate and graduate students in discovery-based learning as major goals.

I am not satisfied with the impact of the DLC on student learning to date, though there are several bright spots, and we will devote major efforts to addressing this issue during the current academic year and following summer. As an important step, I am pleased to report that the Engineering Excellence Fund Committee has committed \$50,000 per year, starting this fiscal year, to the ongoing operations, maintenance and enhancement of the DLC. Finally, we recently

received a \$200 K estate gift for the DLC, which provides a good start in relieving the \$2 M capital debt.

Freshmen Enrollments

There was considerable concern and discussion at the EAC/RDC meeting last spring about a decline in number of women enrolling in the College. The data are now complete and show Fall 2003 undergraduate and graduate women enrollments of 468 (17.5 %) and 262 (23.6%), respectively, compared to 519 (19.4%) and 251 (23.3%) in Fall 2002. Most significantly, the entering freshmen class includes only 79 (14.1%) women for Fall 2003, compared to 115 (18.8%) in Fall 2002. National data have also shown a decline in women undergraduate enrollments in engineering (from 20% in Fall 1999 to 19% in Fall 2001) and an increase in women graduate enrollments (from 19.6% in Fall 1999 to 20.7% in Fall 2001), though data for 2002 and 2003 are not yet available, to see if the trend has continued.

To help determine why students, both male and female, declined our offers of admission for Fall 2003, a written survey was conducted. The survey results and a summary of the data and conclusions are attached. Of the 467 students who declined our offer of admission (including 100 women, or 21.4%), 147 returned the survey (including 43 women, or 29.3% of respondents). The two most important issues brought to light by the survey are the lack of financial assistance and the need for more personal contact. The reputation of CU as a party school was also commented on by several students. The survey results will help us make future improvements with respect to informing prospective students of the quality of our college and of our programs offering more individual contact, providing personal contact in a timely manner during the application process, and setting goals for increased financial aid.

Budget

The state allocation to CU-Boulder was reduced by one-third over FY03 and FY04, leading to a reduction of about 8% in the overall general-fund budget of the campus (which was 25% state appropriation, 63% tuition, 10% indirect cost recovery, and 2% other, prior to the cuts). The cut passed on to the College is 6%, with the other 2% covered at the campus level (primarily from increased tuition revenue). The 6% cut represents \$1.5 M. The cuts were made selectively, rather than across-the-board, with \$762 K by moving Interdisciplinary Telecommunications and Engineering Management to a cash-funded enterprise, \$435 K by cutting two open faculty lines and the differential between the senior retirement and junior replacement salaries on three additional lines, and \$308 K from administrative programs.

The budget picture appears to be improving. The proposed tuition increases of 15% for residents and 7.7% for nonresidents, including Quality for Colorado, were approved (though enterprise status was not approved). Also, the most recent state tax revenues have exceeded revenues. Thus, we do not expect further cuts in FY04, and we may receive additional funding later this year from Quality for Colorado and increased tuition revenues.

Progress on Strategic Planning

The working groups at the April 2003 EAC/RDC meeting focused on various aspects of the College's strategic planning process. Considerable progress had been made on the recommendations and in preparing the strategic plan. Each department and program has completed its summary strategic plan. A draft of the college-wide *Strategic Plan for Excellence* was completed in August 2003. It was subsequently reviewed by the Administrative Council and

three working groups (education, research, and resources) of faculty, staff and students. Using input from these groups, a revised draft was prepared and is appended to this report.

The strategic plan presents bold goals for increasing diversity, initiating and improving innovative educational programs, expanding interdisciplinary research programs, and raising resources. It is a living document, which we will continue to refine over the coming month. Input from EAC/RDC members is sought, either through direct communications to me (robert.davis@colorado.edu, 303-492-7006) or through discussions at our upcoming Fall 2003 meeting.