

College of Engineering and Applied Science University of Colorado

Semi-annual Report prepared 3/31/04 by Robert H. Davis, Dean and Patten Professor

Introduction

The College of Engineering and Applied Science (CEAS) at the University of Colorado at Boulder is dedicated to *Excellence in Education and Research*. Student excellence will be achieved through both core fundamentals and active learning, with the latter including team projects, research experiences, 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 the previous meeting of the CU Engineering Advisory Council and Resource Development Committee.

New Faculty and Administrators

The College is pleased to welcome the following new faculty and administrators this spring:

Dennis Akos, Assistant Professor, Aerospace Engineering Sciences
Wayne Kirschling, Interim Faculty Director, Lockheed Martin Engineering
Management Program
Terry Mayes, Director of Academic Programs and Assessment

Faculty Awards

Frank Barnes of Electrical and Computer Engineering received the Bernard M. Gordon Prize from the National Academy of Engineering in February 2004, in recognition of his innovation in establishing the Interdisciplinary Telecommunications Program at CU-Boulder. The Gordon Prize is NAE's top educational honor and comes with a \$500,000 prize.

George Born of Aerospace Engineering Sciences and Kaspar Willam of Civil, Environmental and Architectural Engineering were elected to the National Academy of Engineering in February 2004. They join 13 other faculty from the campus who have been elected since the academy's formation in 1962.

Four CU engineering faculty received CAREER awards from the National Science Foundation this spring, each providing \$400,000 or more over five years for teaching and research by junior faculty:

- John Crimaldi of Civil, Environmental and Architectural Engineering
- Kurt Maute of Aerospace Engineering Sciences
- Will Medlin of Chemical and Biological Engineering
- Regan Zane of Electrical and Computer Engineering

Ken Gall of Mechanical Engineering received the 2004 Ralph R. Teetor Educational Award from the Society of Automotive Engineers.

David Klaus of Aerospace Engineering received the 2003 Thora W. Halstead Young Investigator Award from the American Society for Gravitational and Space Biology.

Richard Han of Computer Science received the IBM Faculty Award for 2003. He is collaborating with IBM on research related to networked software distribution.

Bernard Amadei of Civil, Environmental and Architectural Engineering was recognized with the "Building a Better World Award" by Ch2M Hill and DuPont for his work in founding Engineers Without Borders.

Rajagopalan Balaji of Civil Environmental, and Architectural Engineering was invited to attend the National Academy of Science's 15th Annual Beckman Frontiers of Science Symposium. NAS has conducted 13 of these events, each with 100 of the best and brightest young American scientists.

Scott Palo of Aerospace Engineering was selected by Sigma Xi, the Scientific Research Society, as the Northwest Regional Young Investigator for 2004.

Buzz King of Computer Science has been invited by the Smithsonian to serve as a founder of the Smithsonian's Encyclopedia of Life--a project that is expected to be of the same magnitude and importance as the Human Genome Project. The goal is to build a Web portal that centralizes access to information on all known species of the planet. There will be about 25 leading scientists and technologists in the group.

Student Awards

Two undergraduate teams were among the 11 Outstanding Winners named in this spring's annual Mathematical Contest in Modeling sponsored by the Consortium for Mathematics and its Applications. A total of 742 teams entered the contest, representing schools in several countries.

- The team comprised of CU students Brian Camley, Brad Klingenberg and Paascal Getreuer developed and analyzed a model that assessed the probability that fingerprints are unique.
- The team comprised of CU students Moorea Brega, Alejandro Contarero, and Corry Lee proposed and tested "QuickPass" systems for the popular rides at an amusement park.

A CU engineering student invention, the Rota-Ride snowboard binding, was selected to be showcased at March Madness for the Mind, a public exhibition of innovative student work sponsored by the National Collegiate Inventors and Innovators Alliance. The exhibit of 15 student inventions was held in March at the Tech Museum of Innovation in San Jose, Calif. Undergraduate students Ben Rushwald and Jeff Giffin took over the project from a previous team, redesigned it, and showed it at the NCIIA conference.

Outreach and Recruiting Highlights

To increase participation in outreach programs (especially for underrepresented students), we have developed a pilot program of personalized efforts focused initially on the Denver Public and Boulder County High Schools. We have been visiting with HS counselors to let them know of the summer opportunities available to their students and teachers at the College of Engineering and Applied Science at CU-Boulder. The teachers and counselors have expressed appreciation for our personal attention. As a result of these visits, we have decided to create an email communication similar to E Notes that will be sent to HS counselors and select teachers across the state, to inform them of the various events available to their students and teachers at the College.

As a result of a generous gift this spring from Jim Abrams, we are collaborating with the University of Colorado Upward Bound Program to create an engineering program for Native American high school students. The CU Upward Bound program provides high school students from targeted Native American communities with the opportunity to experience a college atmosphere before graduating from high school. Students are encouraged to apply to the program during their freshman or sophomore year, and remain in the program until their high school graduation. The engineering program is for six weeks each summer and is designed to strengthen knowledge of and interest in engineering, strengthen academic skills required to succeed as an undergraduate engineering student, and to foster leadership and communication skills.

This year, we have also made progress in our undergraduate recruiting efforts for the College, with an emphasis on more personal communication. Every student who was admitted to the College received a personalized letter from Associate Dean John Bennett, in addition to the letter of acceptance from the Office of Admissions. A follow-up letter and informational flier was sent to the top prospects by Dean Rob Davis. The Engineering Ambassadors are assisting in our recruiting efforts by making phone calls and sending emails to admitted students, with the primary focus being on the top students. A handful of EAC members also agreed to make phone calls to prospective students. The students of the WIEP have sent emails to every admitted female student, and MEP students sent postcards with personal notes to prospective minority students. We have also asked faculty to contact the top students admitted to their respective department to get them to encourage their attendance and answer questions. We have received very positive feedback from students and their parents because of these communications. From these various contacts with the prospective students, we have learned that a primary reason students do not attend CU is the lack of financial aid we offer to students. Top students are not only recruited by other schools, they are offered more financial aid to attend.

Almost every Friday afternoon, we provide a tour of the College of Engineering and Applied Science as part of the Student for a Day Program. Student feedback from previous tours indicates they wanted to see more labs and talk to more students about what life is like as a student at the College. This year, we have changed the tour to include more exposure to the Integrated Teaching and Learning Laboratory (ITLL), the Discovery Learning Center (DLC) and other laboratories around the College. Our current students have been very willing to assist in these efforts and have made themselves available not only during the Friday tours but during the several personal tours we have given to prospective students and their parents who are unable to attend the Friday tours.

Marketing

The Dean's Office has carried out several new marketing initiatives in the past six months, in addition to ongoing publications and public relations activities. New efforts include:

- Redesign of the college website (www.colorado.edu/engineering) to be a more effective marketing tool for prospective students and other constituents;
- Development of a new undergraduate program brochure for prospective undergraduate students as well as a poster that was sent to Colorado high schools, and a follow-up mailer to admitted students to encourage their selection of CU Engineering.
- Development of a special information flier that highlights achievements by CU faculty and students, as well as "good ideas" that can be implemented at other colleges. The flier was sent to engineering deans across the country in March 2004, in advance of the annual undergraduate program survey by *US News and World Report*.
- Additional marketing communications are planned to coincide with the graduate program survey that will be sent by *US News and World Report* to engineering deans and department chairs in the fall.

The Earn Learn Campaign

In October 2003 the Resource Development Committee (RDC) selected the Earn Learn Program as its major focus of this year's fundraising efforts. A goal of \$275,000 to be raised by September 2004 was set. An initial challenge grant of \$25,000 was made by RDC Chair Gary Anderson. This challenge was met and exceeded by December 2003, enabling Dean Davis to make Earn Learn Apprenticeships to 15 students in a pilot program for the Spring 2004 semester. To date \$86,715 has been raised from individuals as a direct result of the RDC campaign. Additionally, two endowments totaling \$143,000 have been designated for Earn Learn, and an estimated \$1,000,000 in estate bequests have been pledged to provide long-term funding. An aggressive effort by the RDC members is continuing to raise an additional \$175,000 from corporate partners and foundations by the September 30, 2004 target date.

Discovery Learning Center

Progress has been made in the use of the Discovery Learning Center (DLC) as a facility for discovery learning, outreach, and interdisciplinary research. The College has funded 12 Discovery Learning Apprenticeships this semester, supporting undergraduate students doing research in 9 of the 11 DLC tenant labs. Applications were solicited from students in December 2003, and 46 students applied. Students were selected by a committee of faculty involved in the DLC. Students were chosen based on their academic record, their work experience, and their expressed interest in specific DLC research projects. The apprentices are 2nd through 5th year students representing all the majors. 5 of the 12 apprentices are female; 3 of the apprentices are minorities. Their work and results will be shared with the College faculty and students at the Undergraduate Research Symposium on 23 April 2004. The apprentices will also be displaying their work in conjunction with the ITLL Design Expo the next day. Advertising for Fall semester apprentices begins in April 2004.

The DLC Collaboratory usage continues to increase. We have surpassed the strategic plan goals of 8 meetings per month. As an example, there were 19 meetings scheduled in March 2004, including one Saturday event and one two-day center research conference. Each

department has held colloquiums and advisory meetings in the Collaboratory, and many centers have held conferences and advisory group meetings.

In the Fall 2003 semester, the senior project team of the TAM certificate program of ATLAS created a "virtual tour" of the DLC aimed at middle school audiences. The students produced a video that can be shown on the lobby video wall. This excellent partnership will continue to be cultivated to create additional materials for the video wall.

Additional new endeavors in the DLC include:

- Michael Eisenberg (CS) is conducting his hands-on course "Things that Think" in the DLC Post-PC Lab, providing students with the latest technology for fast prototyping. Students then use the lab to develop their projects. Prior to the DLC, there was no facility that supported these tools.
- Clayton Lewis (CS) is conducting his courses in the Coleman Lab, providing students with a large facility for collaborative work on software.
- Aerospace Senior Design students are using the SEI lab for their project work.
- Space Grant and L3D have created displays outside their labs to describe their research and outreach programs.

College Infrastructure

Several infrastructure improvement initiatives are underway in the College:

Expansions to the Engineering Center

We have initiated the feasibility studies to add 30,700 sq. ft. to the CS wing of the Engineering Center by building up over the existing CS wing and to add 18,700 sq. ft. to the ChBE wing by expanding out to the east. These studies are the first step in the process of getting campus approval, then CCHE approval, and then state funding. Even if we were able to raise private funding for all of the construction, all the approvals are required to build these expansions and have them operated and maintained as campus facility-managed buildings. There is a rigid schedule that must be adhered to for these approvals, with the earliest possible approval at the July 2005 CCHE meeting, and the earliest completion in summer 2007.

The feasibility analyses included the estimates of the cost to connect into the campus utilities, the cost for external work (landscaping, access), impact on the current building, and the cost to build the new facilities. The CS expansion was estimated to be \$15M, significantly more than the \$5M shared at the October, 2003 EAC meeting. The increase was due to larger expansion, adding the costs of utility connections and external work, and adding the work to modify the existing floors to support the new floors. The ChBE expansion was estimated to be \$8M.

An alternative proposal was provided to both departments to build a new Engineering Research Building on the westernmost plat (called Pod-I) of the Research Center. Pod-I is just slightly east of Colorado Blvd. and 30th St. It was estimated that the cost of a 3-story wing for CS and a 2-story wing for ChBE would be a total of \$25M, with significantly more space than the two expansion projects. An advantage to this site is that we could use an expedited approval process, if we could raise the funds privately. The disadvantage is the distance from the Engineering Center, about ½ mile. Both departments are evaluating the two alternatives and the ability to raise the necessary funds.

Exabyte

CADSWES and the HydroClimate Systems Lab of Civil, Environmental and Architectural Engineering will be moving to Exabyte in early summer 2004. This move will double CADSWES current space and provide them with a computer training room for their classes. The campus is providing about 70% of the \$200K required to renovate the 7000 square feet of space.

The Multicultural Engineering Program and the Women in Engineering Program will be moving into the current CADSWES space this summer, providing them with a shared facility in a location near the Dean's Office in the Engineering Center that has more student traffic. The vacated MEP and WIEP space will be used to help meet space needs for the Department of Computer Science.

Nanotechnology Lab

\$600K of special congressional funding and an equal amount of campus and college matching funds of funding have been provided to launch our nanotechnology lab. An additional \$4-5M of funding is being sought over the next several years to build out Phase 1 of the facility. A faculty committee, representing departments involved in nanotechnology research, is evaluating locations for Phase 1. The two most promising locations are the 2B (basement) level of the DLC and Exabyte. Exabyte offers the most expansion space while DLC provides the best location for fostering initial interdisciplinary use of the lab.

High Performance Computing Lab

The Provost is providing \$100K, matched by the College, to construct the first phase of a College High Performance Computing Lab. We will be renovating the CS computer lab in ECEE 2B80 to provide the cooling, power, and security to support high performance computer systems and clusters purchased by departments. Our goal is to provide a modern, more cost-effective facility than could be built by each department for its individual needs. We appreciate the involvement of EAC members and their companies in helping us design this facility.

ITS UNIX Operations Move

The ITS UNIX Operations Group currently occupies 1640 sq. ft. in the ChBE wing of the Engineering Center. This group will be moving to space in the Stadium in the summer and the space will be assigned to ChBE for new faculty, staff and graduate students.

Engineering Center "Beautification" and Renovation

The departments unanimously voted to expend some renovation money to improve areas in each department in need of basic renovation such as painting, carpet, and furniture. The College has allocated \$100K of funds across the departments for specific "beautification" projects proposed by each department. The College has also allocated \$20K to begin improving the Engineering Lobby to support the informal group work that continually goes on in that area. An additional \$200K has been allocated by the College to the departments for renovating existing space for more effective use.

We are working closely with the campus Facilities Management to prioritize their work in the Engineering Center, and when feasible, offer cost-sharing to accelerate the time frame. Facilities Management is hoping to be able to paint all the major hallways in the Engineering Center this summer, if they receive the funds they have requested.

New Centers

The College launched the new Research and Engineering Center for Unmanned Vehicles (RECUV) in late fall, 2003 to address research and education needs related to development and operation of unmanned aerial, land-surface, and under-water vehicles, which may be remotely or autonomously operated. For several years, college faculty have been developing technologies to monitor meteorological and sea-ice observations in the Arctic, wildfires, spreading of pollutants or toxins, floods, and crops by using a variety of remotely piloted aircraft in collaboration with industry, NASA and defense agencies. The founding director of RECUV was Prof. George Morgenthaler, and Prof. Brian Argrow took over the reigns in January, 2004. The Center includes 16 faculty from four departments. The main objective of the Center is to develop commercial, defense and basic research uses of unmanned vehicles that are equipped with sensors. Current projects include the Tornado Chaser Remotely Piloted vehicle in collaboration with the National Severe Storms Laboratory.

The College formed a new Computer and Communications Security Research and Education Center (CCSC) in early fall, 2003 to advance the technologies of communications and computer security and the policies that govern their proper development and use. The Center has 11 faculty from three departments, who bring expertise in a wide array of disciplines, including telecommunications, database management, networks, operating systems, software engineering, sensors, mathematics, economics, law, public policy, information theory, as well as human factors. Prof. Alexander Wolf in Computer Science is the Director of CCSC. The Center's mission includes education of graduate and undergraduate students, as well as assisting industry partners in this very important area of national concern. The Center addresses a range of security issues and includes the needs of government agencies, businesses and industry, including banking, health care, transportation, telecommunications, energy, etc., which depend on secure communications and computer systems. The Center is looking at problems from both technical and social perspectives to find a sustainable balance between economic growth and a secure cyber infrastructure. The Center offers undergraduate and graduate courses in computer and communications security. Industry and government partners include U.S. Air Force, Army Research Office, DARPA, IBM, the Internet2 Consortium, and others.

In anticipation of a new federal Department of Transportation initiative to form several university centers to address surface transportation research needs, faculty in the Department of Civil, Environmental, and Architectural Engineering are proposing a University Center for Applied Integrative Research in Transportation, which will focus on multidisciplinary approaches to security, safety, cost, risk assessment, behavior of constructed facilities under a wide range of loading, environmental factors and sustainability. The Center will build on innovative research already underway in the College, and the work will be done in collaboration with faculty in other departments as well as with other campuses within the University. Prof. Ross Corotis leads the effort, and he is joined by 12 other faculty.

Technology Transfer

In collaboration with the Office of Contracts and Grants (OCG), personnel in the College and the Technology Transfer Office are reviewing summaries of awarded research

proposals, mainly from federal funding agencies, where the purpose is to develop early collaborations between principal investigators and external technology scouts, including start-up companies and investors, which will help foster research and development, applications, and placement of students. OCG provides summaries that are used to assess invention and disclosure potential, which are further distributed to volunteer members of EAC, who are assisting in scouting for external industrial and development partners.

Strategic Plan

The College published its *Strategic Plan for Excellence 2003-2008* in December 2003. It outlines specific actions to achieve bold goals associated with our objectives of excellence in research, education and resources. We will continually assess our progress toward meeting these goals, provide annual reports and updates, and maintain the flexibility to review our goals and plans as external and internal conditions change. Our new Director of Academic Programs and Assessment will assist with the educational and assessment portions of the strategic plan.

Other Noteworthy Items

The graduate program of the College was ranked 33rd overall (19th among publics) for U.S. engineering colleges in spring 2004, up from 37th overall (21st among publics) in spring 2003.

The College has launched a new International Engineering Certificate Program in German, organized by Sherry Snyder from the Engineering Dean's Office and Professor Kandace Einbeck from the Department of Germanic and Slavic Languages and Literatures. Students in the certificate program take language, literature, and engineering courses, a culture class, and an international internship. Initially, the program is for engineering students who are studying German, but plans are to expand it to include other foreign languages in the future.

In December 2003, college and campus leaders celebrated a new Memorandum of Understanding with Sandia National Laboratories, which is expected to result in expanded research collaboration in microsystems technologies and other areas. The MOU formalizes the partnership that has been developing over the last three years by detailing plans for research visits, access to facilities, and the handling of intellectual property.

The annual Engineering Awards Banquet is coming up on 16 April 2004, following the spring EAC/RDC meeting. The DEAA Selection Committee has chosen the following recipients for the 2004 Distinguished Engineering Alumni awards:

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| Enid M. Ablowitz | Special |
| Lori A. Clarke | Research & Invention |
| Gregg Arthur Jacobs | Research & Invention |
| Vern Norviel | Industry & Commerce |
| Lucinda M. Sanders | Industry & Commerce |
| Marshall L. Silver | Government Service |
| Stein Sture | Education |