

# **A Strategic Plan for Excellence**

## **2003-2008**

**College of Engineering and Applied Science  
University of Colorado at Boulder**



Robert H. Davis, Dean  
December 2003

## Preface and Overview

This *Strategic Plan for Excellence* was developed to guide the College of Engineering and Applied Science at CU-Boulder over the next five years, so that we make wise use of limited resources and focus on high-quality education and research programs that attract additional resources. Our planning process was formally initiated in March 2003 with a college-wide faculty and staff meeting to review our vision of excellence in research and education and the purpose and process for strategic planning. During the following month, the external Engineering Advisory Council (EAC) and Resource Development Committee (RDC) met to assess the strengths and weaknesses of the college and to provide guidance on vision and plans for education, research, and resource development. Each department and program then submitted its summary strategic plan at the end of the Spring 2003 semester, and these plans were reviewed and revised over the summer, serving as input for me to write this college-wide plan. The plan also draws on the Strategic Vision 2001, prepared in 1999-2001 under the leadership of Dean Ross Corotis. Finally, drafts of this plan were reviewed by faculty, staff, students and our EAC and RDC.

Our broad vision is to be widely recognized for excellence and leadership in research and education, with an emphasis on active, discovery and service learning. After presenting our mission, vision and value statements, this strategic plan provides an overview of the current state of our college, including an analysis of its strengths, weaknesses, opportunities and threats. We then set forth three broad objectives for the college:

- *Through interdisciplinary research excellence, develop new knowledge at the forefront of engineering and technology that enhances the well-being of individuals and society*
- *Through active engagement in discovery and service learning, provide educational excellence to recruit and prepare students for outstanding leadership and service*
- *Through outstanding faculty and staff, and enhanced facilities and funding, build resource excellence for supporting continued advancement in research and education*

These objectives are followed by specific goals with measurable outcomes in the areas of research, educational, and resource excellence. Finally, tactical plans in the form of action items, responsible individuals and target dates are provided to achieve the objectives and goals. The plan does not end there, however, as we will continually assess our progress toward meeting the goals, provide annual reports and updates, and maintain the flexibility to revise our goals and plans as external and internal conditions change.

I thank all of the faculty, staff, students, and EAC and RDC members who participated in the strategic-planning process. Special thanks go to Associate Deans John Bennett and Stein Sture for their contributions to the educational and research vision/plans, respectively, to Assistant Dean Jim Sherman for his contributions to the educational vision/plans, to Assistant Dean JoAnn Zelasko for her contributions to the resource vision/plans and for coordinating the strategic plans from departments and programs, and to Sharon Vaughan for word processing this document.

Robert H. Davis  
Dean & Patten Professor  
December 2003

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# 1. Statements of Purpose

If your vision is for one year, plant wheat.  
If your vision is for ten years, plant trees.  
If your vision is for a lifetime, plant people.  
-Old Chinese Proverb

## 1.1 Mission

The mission of the College of Engineering and Applied Science at the University of Colorado at Boulder is to provide education and training in engineering and related fields to prepare students as future leaders and responsible citizens and to generate new knowledge in engineering and technology to assist individuals and improve society.

## 1.2 Vision

The vision of the College of Engineering and Applied Science is to be widely recognized for excellence and leadership in both research and education, with emphasis on interdisciplinary research teams and active, discovery and service learning through hands-on experiences. Our vision for excellence incorporates four themes:

- *Research excellence for an improved society and quality of life*
- *Educational excellence for leadership and citizenship*
- *Student excellence through active, discovery and service learning*
- *Faculty excellence through innovations and synergy in teaching and research*

## 1.3 Values

As an institution, we embrace the following core values and skills, which we seek to impart to our students as outcomes of their education:

- *Technical excellence and knowledge in modern engineering, mathematics and science*
- *Ability to think critically, analyze data, and solve complex engineering problems*
- *Ability to communicate effectively to diverse groups*
- *Ability to contribute effectively as individuals and in multidisciplinary teams*
- *Knowledge of contemporary issues and preparation for professional practice and global and societal leadership and citizenship*
- *High ethical standards and character, including integrity, responsibility, honesty, and respect for others*
- *Desire and skills for life-long learning and personal and professional development*

# 2. Where Are We Today?

The College of Engineering and Applied Science is a top-tier public research institution, with a 110-year history of engineering education. It currently has six academic departments, 165 regular (tenured/tenure-track) faculty, 22 full-time instructional faculty, and 10 full-time research faculty. In Fall 2003, the college enrolled 2,667 undergraduate students and 1,112 graduate students seeking bachelor's, master's and doctorate degrees in 13 fields of engineering. The current Engineering Center was completed in 1966. With the addition of the Integrated Teaching and Learning Laboratory in



Engineering undergraduate students work on a team project at a lab station in the ITLL.

1997 and the Discovery Learning Center in 2002, the entire complex has 530,000 square feet of classrooms, research laboratories, computing facilities, offices and other space in support of our education and research efforts.

## 2.1 Departments and Programs

The six academic departments in the college, each offering B.S., M.E./M.S. and Ph.D. degrees, are

- *Aerospace Engineering Sciences*
- *Chemical and Biological Engineering*
- *Civil, Environmental and Architectural Engineering*
- *Computer Science*
- *Electrical and Computer Engineering*
- *Mechanical Engineering*

Bachelor's degrees also are offered through affiliated departments and programs in Applied Mathematics, Engineering Physics, and Environmental Engineering, while master's degrees are also offered in Engineering Management and in Telecommunications.

In addition, the college has several innovative programs and unique facilities:

- **Center for Advanced Engineering and Technology Education (CAETE)** - This partnership with the Division of Continuing Education offers master's degrees through the college's Engineering Management Program and Interdisciplinary Telecommunications Program. Graduate courses for professional development, certificates and degrees are offered both on campus and through distance learning in a variety of fields related to engineering, technology and applied science.
- **Colorado Space Grant Consortium** – This NASA-sponsored program provides opportunities for students to participate in a range of space-related activities, from hands-on development and operation of space craft and satellites to multidisciplinary courses and seminars on space science, technology and policy.
- **Discovery Learning Center (DLC)** – The DLC provides a 45,000-square-foot, technology-rich research and learning environment where undergraduate and graduate students, faculty, and industry partners collaborate on state-of-the-art interdisciplinary discovery-based learning and research.
- **Engineering for Developing Communities (EDC)** – The EDC program provides student teams with service-learning experiences through sustainable engineering solutions and projects to meet basic needs of developing communities, partnering with the communities, the CU-founded Engineers Without Borders, and other groups.
- **Herbst Humanities Program** – This unique program offers humanities courses for undergraduate engineering students. These discussion-based courses are in small sections, to encourage active participation by all members and provide individual support and feedback on writing assignments.
- **Integrated Teaching and Learning Laboratory (ITLL)** – The ITLL is a shared undergraduate learning environment of 35,000 square feet dedicated to hands-on learning, outreach, and enhancement of undergraduate curricula.
- **Interdisciplinary Research Centers** – The college is host to 18 interdisciplinary research centers, spanning the areas of biotechnology and bioengineering, earth systems and environmental engineering, information science and technology, materials science and engineering, and space sciences and engineering.
- **Multicultural Engineering Program (MEP)** – The MEP provides a community dedicated to academic excellence in recruiting and supporting multicultural and first-generation students historically underrepresented in engineering and applied science.
- **Women in Engineering Program (WIEP)** – The WIEP provides mentoring, support and community activities to promote the recruitment and success of women engineering students and to increase the awareness of engineering and applied science among prospective female students.



At left, students participate in research on 3-D visualization, a technology being explored at the college's DLC. At right, students prepare to launch experiments on a high-altitude balloon as part of a program sponsored by the Colorado Space Grant Consortium.

## 2.2 Distinctions

This strategic plan further enhances the distinctive qualities of the College of Engineering and Applied Science, which are:

- *National prominence in engineering education through the paradigm of integrated teaching and learning*
- *Research excellence at the frontiers of knowledge through vertically (undergraduates, graduate students, faculty) and horizontally (interdisciplinary teams and industry partners) integrated discovery learning*
- *Academic and societal leadership through service learning and outreach*
- *The opportunity for all students to participate in enrichment experiences and partnerships with individual faculty in discovery, service and professional learning*

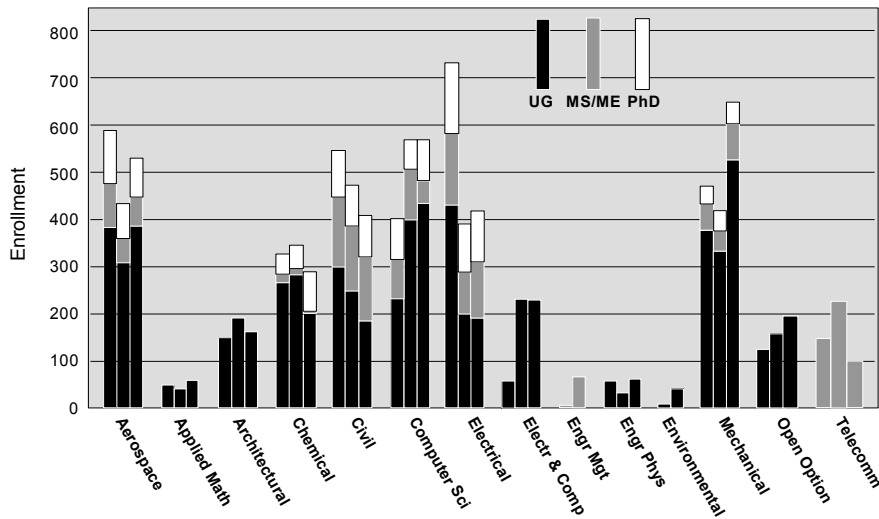
## 2.3 Faculty and Students

Table 1 shows that the number of regular faculty has grown steadily, with an increase of 41% since 1985. During the same period, the numbers of BS, MS/ME, and PhD students have increased by 14%, 25%, and 74%, respectively. The percent increase in the number of faculty is greater than that for students, to provide for smaller classes, more individualized instruction, and substantial growth in research activities during this period.

**Table 1** – Numbers of regular (tenured/tenure-track) faculty and full-time students in the College of Engineering and Applied Science at CU-Boulder.

Year (Fall)	# Regular Faculty	# BS Students	# MS/ME Students	# PhD Students
1980	~95	2133	320	85
1985	117	2350	500	279
1990	147	2340	590	440
1995	152	2284	720	445
2000	160	2580	599	411
<b>2003</b>	<b>165</b>	<b>2667</b>	<b>627</b>	<b>485</b>

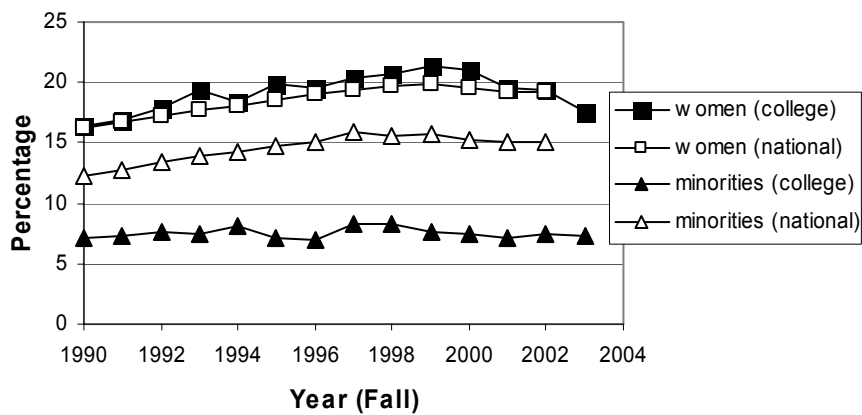
A breakdown of enrollments by major and degree is provided in Figure 1. Over the past ten years, there have been large gains in undergraduate enrollments in Computer Science, Electrical and Computer Engineering, Environmental Engineering (new degree), and Mechanical Engineering, while undergraduate enrollments in Chemical Engineering, Civil Engineering and Electrical Engineering have declined. At the PhD level, Chemical Engineering and Mechanical Engineering have grown substantially, but the PhD enrollments in other majors have been nearly steady or declined.



**Figure 1** – Enrollments in the College of Engineering and Applied Science by major and degree. The three bars for each major are Fall 1993, Fall 1998, and Fall 2003 (left to right).

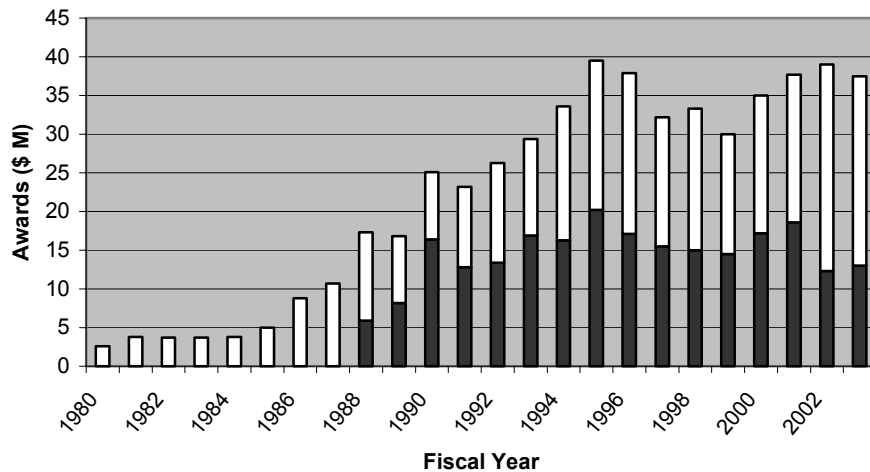
Figure 2 shows that the percentage enrollment of women undergraduates rose steadily throughout the 1990s, reaching a peak of 21.4% in 1999, but has now declined to 17.5%, mirroring data for the nation as a whole. The percentage enrollment of underrepresented minority groups (African American, Hispanic, Native American) has been nearly steady over this period at about 7.5% of the undergraduate students, which is one half of that for the nation as a whole. The percentage of women graduate students in the college has increased substantially, from 15.0% in Fall 1992 to 23.6% in Fall 2003, while the percentage of underrepresented minority graduate students during this period has increased from 3.9% to 5.0%. The most recent (2002) national data show 20.7% women and 5.4% underrepresented minorities among engineering graduate students. Faculty diversity in the college has seen gains, from 6.8% to 9.7% women and from 4.8% to 5.6% underrepresented minorities for the same period. The most recent national data show 5.1% women and 6.0% underrepresented minorities among regular engineering faculty.

**Figure 2** – Percentage of engineering undergraduate students who are women or underrepresented minorities.



## 2.4 Funding

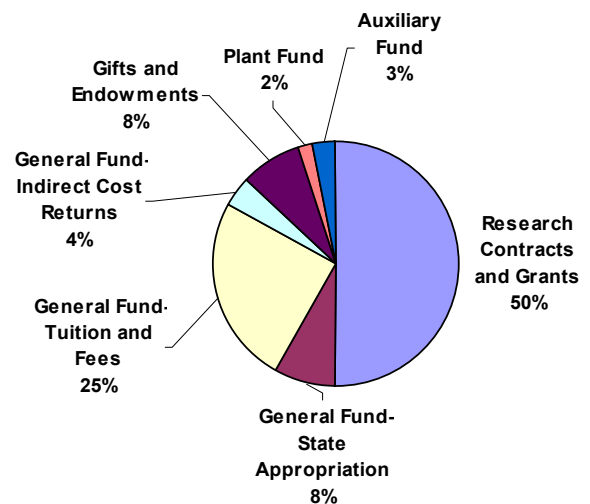
Figure 3 shows the research contract and grant awards to the college since 1980. Research grew tenfold during the mid-1980s to mid-1990s, from about \$4 million per year to nearly \$40 million per year. It subsequently dipped to about \$30 million per year in the late 1990s and has now rebounded to nearly \$38 million per year, or \$235 K per regular faculty member. The sources of these awards in fiscal-year 2002 include the National Science Foundation (27%), Department of Defense (16%), NASA (13%), other federal agencies (13%), industry (8%), non-profits (8%), state/local governments (7%), other universities (7%), and other (1%). A significant portion (one-third to one-half) of this funding comes through the 18 interdisciplinary research centers within the college, drawing on faculty from various departments and funding from corporate sponsors and/or federal sources.



**Figure 3** – Contract and grant awards received per fiscal year by the College of Engineering and Applied Science (shaded portion = centers).

The total external funding received for the college during fiscal-year 2003 (FY03) is \$58.1 M. This total includes \$37.5 M in contracts and grants received directly by college faculty, \$9.9 M in contracts and grants received through partnerships of college faculty with other units on campus, \$9.5 M in gift and endowment funds received, and \$1.2 M in direct support from the Howard Hughes Medical Institute. Internal funding during FY03 was \$25.5 M. This total includes \$16 M from tuition and fees, \$7 M from state appropriations and financial aid, and \$2.5 M in indirect cost return from grants.

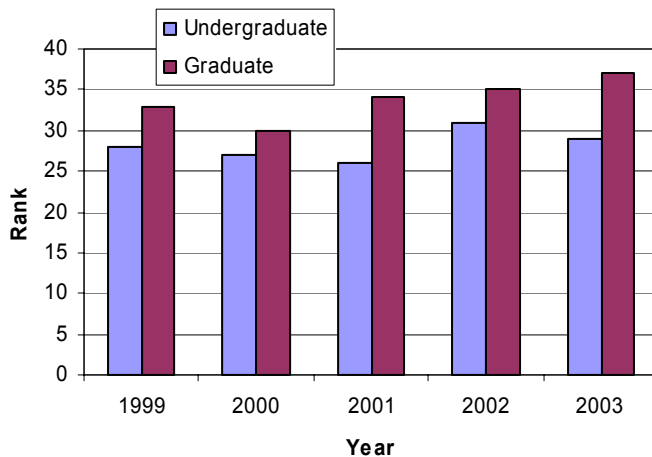
The expenditures in the college during FY03 total approximately \$75 million, not including related expenditures made through other units. As shown in Figure 4, the major sources of funds for these expenditures include research contracts and grants (50%), student tuition and fees (25%), state appropriations (8%), and private giving (8%). State appropriations were cut by almost one-third from FY03 to FY04 and so will represent a smaller percentage of the college budget in the future.



**Figure 4** – Expenditures in the College of Engineering and Applied Science in fiscal-year 2003, split out by the revenue sources from which the expenditures were made. The total is \$74.5 million.

## 2.5 Rankings

The annual rankings of our college by the *U.S. News & World Report* are shown in Figure 5. These rankings are based on reputation (surveys of engineering deans and corporate recruiters) and statistical data on students, faculty and research activity. In the 2003 surveys, our undergraduate and graduate programs are ranked 29 (tied with four other schools) and 37, respectively, out of 185 surveyed U.S. engineering schools with PhD programs. Among public institutions, the college is ranked 17<sup>th</sup> (tied) and 21<sup>st</sup> at the undergraduate and graduate levels, respectively. Within engineering specialties, Civil Engineering is 17<sup>th</sup> at the graduate level (11<sup>th</sup> among publics) and Aerospace Engineering is ranked 13<sup>th</sup> at the undergraduate level (9<sup>th</sup> among publics) and 19<sup>th</sup> at the graduate level (14<sup>th</sup> among publics). Our other departments are not ranked in the top 20 of their disciplines. The discipline rankings are based on a selection of the 10 best programs by each engineering dean, and the 20 programs in each discipline receiving the most selections are reported.



**Figure 5** – Rankings of the College of Engineering and Applied Science among U.S. engineering schools with PhD programs, by the *U.S. News & World Report*.

The most recent comprehensive rankings by the National Research Council of engineering doctorate programs in the U.S. were published in 1995 and based on a 1993 survey of faculty and statistical data. All six departments in the college are ranked in the top 35 of public institutions, and three are in the top 20 (Aerospace at 8<sup>th</sup>, Civil at 15<sup>th</sup>, and Chemical at 16<sup>th</sup>). There were 193 engineering institutions, including 150 public institutions, that participated in the study, out of 256 total institutions in the U.S. granting engineering doctorate degrees.

## 2.6 SWOT Analysis

### 2.6.1 Strengths of the College

- Good national rankings (top 20% in *U.S. News & World Report* rankings at both graduate and undergraduate levels), and the top-rated engineering program in a broad geographical region
- Strong research funding (tied for 21 out of 185 engineering PhD-granting colleges in research expenditures surveyed for the *U.S. News & World Report*)
- Innovative educational programs and unique facilities (e.g., ITLL, DLC, Herbst)
- Strong development actions (\$83 M in gifts received for the College of Engineering and Applied Science during the capital campaign of FY97-FY03, more than double that of any other school/college on the Boulder campus)
- Outstanding young faculty (e.g., 12 Presidential Young Investigator Awards, 14 Faculty Early Career Development Awards, 5 National Young Investigator Awards, 2 Presidential Faculty Fellows and 2 Presidential Early Career Awards for Scientists and Engineers from the National Science Foundation)
- Strong senior faculty (e.g., over 50 are fellows of one or more professional societies, and six current or retired faculty are members of the National Academy of Engineering)
- High quality undergraduate students (average SAT of 1250 and ACT of 27, with 40% in the top 10% of their high-school classes)
- Active Engineering Advisory Council (EAC) and Resource Development Committee (RDC), in addition to external advisory groups for departments and programs

### **2.6.2 Weaknesses of the College**

- National recognition has lagged growth in research funding and academic success of faculty (e.g., only two current faculty in the National Academy of Engineering, and rankings have not improved in past five years)
- Age of current building (nearly 40 years old) and insufficient space for five-year projections (e.g., 110,000 sq. ft. current research labs available vs. 150,000 sq. ft. projected need)
- Many regular faculty have low research activity (80 had less than \$50 K in sponsored research expenditures in FY03, and 44 had no sponsored research expenditures)
- Low representation of women and minorities (e.g., 18% undergraduate women is near national average, 7.5% undergraduate underrepresented minorities is half of national average) and inadequate resources to offer enough competitive scholarships
- Low selectivity of graduate students (e.g., 55% applicant acceptance rate in 2002 is the highest among the top 50 engineering schools listed by the *U.S. News & World Report*, with the next highest at 36%)

### **2.6.3 Opportunities for the College**

- Federal funding initiatives in several areas of college strengths (e.g., space science and technology, biological science and technology, resource sustainability, information technology, security, and nanotechnology)
- Improved non-federal revenue possibilities (e.g., alumni and corporate gifts, foundations, enterprise activities, tuition and fees)
- Expansion of internal and external partnerships (e.g., CU Alliance for Technology, Learning and Society (ATLAS), CU Coleman Institute for Cognitive Disabilities, CU Division of Continuing Education, CU Health Sciences Center, CU science departments, CU research institutes, high-technology industry, and federal laboratories)
- Technological advances (networked/distributed computing, world-wide web, telecommunications, etc.) that can be used in recruiting, communications, on-campus and distance education, and research
- Increasing number and diversity of high-school graduates (e.g., 7% increase in total Colorado graduates, with Hispanics increasing from 15% to 23% of this total, projected from 2002 to 2012, see [www.wiche.edu](http://www.wiche.edu))
- Increased involvement of alumni in college programs

### **2.6.4 Threats to the College**

- Current lack of state capital funds (needed for new buildings, major renovations, and specialized facilities)
- Low in-state tuition and state appropriation (2002-03 annual values of \$3,500 tuition and \$4,400 state appropriation per resident student are the lowest among 15 peer institutions in a recent study by the University of Virginia: [www.colorado.edu/pba/budget/peer](http://www.colorado.edu/pba/budget/peer)), leading to reduced opportunities to invest in improved infrastructure, including administrative staff, teaching assistants, laboratory facilities, equipment, and faculty startup funds
- High non-resident tuition of over \$20,000 per year makes it difficult to recruit and support non-resident graduate students, especially international students who remain nonresidents for their entire studies
- Competition for federal funds and high-performing faculty and students, primarily from other outstanding institutions with greater commitment of public resources
- Current depressed economy reduces endowment value, private giving, job opportunities for graduates, and industry and state support
- Declining national enrollments in engineering, including among women and underrepresented minorities

- Faculty salaries for Associate and Full Professors in several departments lag those at other public institutions by an average of 3-8% (see [www.colorado.edu/pba/facstaff/facsal](http://www.colorado.edu/pba/facstaff/facsal)), with even greater differences when compared to top schools that compete for our best faculty

### **3. Where Would We Like to Be in Five Years?**

#### **3.1 Objectives**

The five-year strategic plan for the College of Engineering and Applied Science has three broad-reaching objectives associated with our vision of excellence in education and research:

- *Through interdisciplinary research excellence, develop new knowledge at the forefront of engineering and technology that enhances the well-being of individuals and society*
- *Through active engagement in discovery and service learning, provide educational excellence to recruit and prepare students for outstanding leadership and service*
- *Through outstanding faculty and staff, and enhanced facilities and funding, build resource excellence for supporting continued advancement in research and education*

These three general objectives are supported by the measurable goals (outcomes) and metrics listed below, along with the corresponding action items described in Section 4.

#### **3.2 Goals and Metrics**

##### **3.2.1 Research Excellence**

Our vision of excellence in research is supported by initiatives to enhance both core and emerging areas of research distinction. Areas of core research strength in the college include aerospace engineering and science, computational science and engineering, earth systems engineering, electromagnetics/photonics/electronics, mechanics of fluids/materials/structures, and materials formation and characterization. Areas of emerging research strength in the college include assistive technologies, biotechnology, information science and technology, micro/nanotechnology, and security and safety. These core and emerging strengths provide the foundation for several new college and campus initiatives. Expanded knowledge to improve and protect society and assist individuals is generated through the cooperative efforts of faculty, students, and collaborators from university, industry and government laboratories. Our specific goals and outcomes as measures of research enhancements over the next five years are listed below, while the new faculty, facilities and financial resources necessary to achieve these goals are listed in the subsection on *Resource Excellence*.

- Increased annual contract and grant awards by 10% per year, to \$60 M by FY08, with the increase supporting both core areas and emerging areas.
- Increased annual PhD degrees by 10% per year, to 100 by FY08, with a long-term goal of 0.75 PhD degrees awarded per faculty member per year within 10 years.
- Establishment least three or more major initiatives in areas of emerging distinction aligned with campus-wide or system-wide efforts (e.g., assistive technologies, biotechnology, homeland security, information technology, and micro/nanotechnology) during FY04-FY08, with college faculty taking lead roles.
- Addition of at least five interdisciplinary research centers or major block grants (\$2 M or more) during FY04-FY08, supporting both core and emerging areas of distinction, with at least three of these centers/grants having substantial efforts related to homeland security.
- Increased external collaborations with industry, as well as partnerships with other universities and federal laboratories, as measured by a 10% increase in industry contracts and grants per year, to \$6 M in FY08.

- Increased involvement of all faculty in research, with specific goals of increasing the number of regular faculty with annual research expenditures above a threshold minimum of \$50 K by 10% per year (starting from the FY03 baseline of 86) and also increasing the number above \$150 K by 10% per year (starting from 49 in FY03).
- Increased average number of peer-reviewed journal publications per faculty member per year from 2.5 in 2002 to 3.0 in 2007, with a similar increase in journal-quality conference proceedings in selected fields that emphasize leading conferences.

### 3.2.2 Educational Excellence

Our vision of excellence in education is supported by curricula and initiatives to enhance student learning through both coursework and enrichment experiences of discovery learning (e.g., undergraduate research, senior thesis), professional learning (e.g., internships, co-op experiences), and service learning (e.g., K-12 outreach, community service, leadership, course assistance). We seek students with outstanding qualifications and diverse backgrounds, and we provide them with an excellent preparation for life-long service and leadership. Our curricula and programs focus on core fundamentals (math, science, engineering analysis and design, oral and written communication,



Graduate students and faculty develop a visual/haptic interface in an interdisciplinary research and education project.

teamwork, leadership, service, humanities and ethics. In particular, we strive to be widely recognized as a model program for modern engineering education. Our specific goals and outcomes as measures of educational enhancements over the next five years are listed below, and the resources necessary to achieve these goals are described in the subsection on *Resource Excellence*.

- Improved rankings of our undergraduate program to the top 30 in 2005 and the top 25 in 2007, with a long-term goal of achieving the top 10% of the approximately 200 PhD-granting U.S. engineering colleges within 10 years.
- Improved rankings of our graduate program to the top 30 in 2007 and the top 25 in 2009, with a long-term goal of achieving the top 10% of the approximately 200 PhD-granting U.S. engineering colleges within 10 years.
- Expanded opportunities for all undergraduate students to participate in one or more extracurricular enrichment experiences of discovery learning, professional learning, or service learning before graduation, with at least one-third of the undergraduate population participating each year by FY08.
- Enriched curricula so that all undergraduate students participate in at least two courses in which oral and written communication constitute a significant learning objective, at least two courses where team-based, active learning (including open-ended design and hands-on experience) is emphasized, and a meaningful capstone design experience before graduation.
- Improved quality of undergraduate advising, as measured by surveys of graduating seniors, with a goal of 100% rating their advising experiences as satisfactory or better within three years.

- Increased diversity of our student population by 10% per year, to 7.5% and 10% underrepresented minorities and 30% and 25% women at the graduate and undergraduate levels, respectively, by Fall 2007, with a 10-year goal of reflecting representation of women and minorities in our region.
- Increased number of undergraduate applicants by 5% per year, without increased enrollments, with the entering classes exceeding the current measures of high-school GPA, class rank, and standardized test scores.
- Increased PhD enrollments by 5% per year, to 600 students by Fall 2007, with MS enrollments holding steady at about 600 students, and improved quality measures of incoming graduate students by Fall 2005 to 3.60 average undergraduate GPA (from 3.47 in Fall 2002) and 765 average quantitative GRE (from 753 in Fall 2002), while increasing the applicant pool so that no more than 30% of the applicants are selected for admission.
- Improved quality of instruction, as measured by student and peer evaluation, with a goal of increasing the number of instructors rated above 3.0/4.0, and decreasing the number of instructors rated below 2.0/4.0, by 5% per year.
- Full accreditation of undergraduate engineering programs, with effective assessment strategies and continual improvement, including preparation for professional licensing where appropriate.



Students work together in the Multicultural Engineering Program Study Center.

### 3.2.3 Resource Excellence

Our vision for resource excellence is to generate the necessary supporting resources and employ them with wise stewardship to facilitate our ambitious goals and plans for educational and research excellence. These resources include outstanding and well-prepared faculty and staff, substantial alumni involvement, modern facilities for education and research, and increased funding from a wide variety of partners. Specific goals and metrics for enhancing our personnel, facilities, and funding are provided below, and the action plan to meet these goals is given in Section 4. In particular, we seek to add over a five-year period 10 new faculty lines to support research growth and educational enhancements, plus \$6.8 M in continuing annual institutional funding (a 25% increase) and \$12 M in annual private giving (a 33% increase) to support the proposed enhancements in faculty, staff, students, programs, and facilities.

- \$1.0 M in new continuing annual institutional funds by FY08, to invest in an average of two faculty growth lines per year during FY04-FY08. These growth positions plus an average of eight faculty replacement positions per year will provide for strategic hiring of a diverse mix of about 10 junior, mid-career, and senior faculty each year who are leading experts in targeted core and emerging areas of research strength.
- \$1.5 M in new continuing annual institutional funds by FY08, to provide a doubling of faculty startup support, to help recruit and facilitate the success of approximately 10 outstanding new faculty per year, with average startup needs of \$200 – 400 K. Include transitional support for new research faculty, who will take lead roles in the proposed research and discovery-learning initiatives.

- \$1.0 M in new continuing annual institutional funds (post inflation) by FY08, to provide faculty salaries that are competitive with other top engineering schools, requiring annual raise pools of inflation plus 1.5%.
- \$20 M in additional faculty endowment gift funds in the next five years (doubling the current amount), including two fully endowed chairs @ \$4 M, four partially endowed chairs @ \$1.5 M, eight named professorships @ \$500 K, and eight named faculty fellowships @ \$250 K, spread over all departments, with at least half of these new endowments received by FY08 versus pending as pledges or bequests.
- At least three college faculty elected to the National Academy of Engineering in the next five years, and at least one major national or international society award received by a faculty member in each department each year.
- Expanded alumni involvement, with a goal of increasing by 10% per year the number of alumni connecting with the college through events, giving, or service, from a base of about 3,100 giving and 200 serving in FY03.
- \$300 K in new continuing annual institutional funds by FY08 to provide a doubling of matching funds for research equipment and proposals.
- \$800 K in new continuing annual institutional funds by FY08 for curriculum-based program enhancements to enrich the student learning experience, including support for full-time instructional faculty and teaching assistants (\$400 K), laboratory equipment and materials (\$300 K), and the new Engineering Honors Program (\$25 K) and Engineering Advising Program (\$75 K).
- \$700 K in new continuing annual institutional funds by FY08 for extracurricular student programs, including the Discovery Learning Initiative (\$325 K), Service Learning Initiative (\$175 K), Professional Learning Initiative (\$50 K), and Engineering Outreach Program (\$150 K). These funds will be used primarily for direct student support in discovery learning (\$250 K) and service learning and outreach (\$250 K), and secondarily for staff salaries (\$125 K) and operations (\$75 K).
- \$10 M in new endowed student gift support by FY08, to supplement the current student endowment of \$14 M, with a long-term goal of meeting the demonstrated financial need of every prospective engineering student. This endowed support will include undergraduate scholarships (120 @ \$50 K), graduate fellowships (8 @ \$250 K), and earn-learn assistantships (80 @ \$25 K), with at least half of these new endowments received by FY08 versus pending as pledges or bequests.
- Doubling of the annual giving support for the Dean's Fund for Excellence, from \$250 K in FY03 to \$500 K in FY08.
- \$10 M in current and endowment gifts over the next five years for educational and research support (DLC, ITLL, department laboratories and programs).
- \$300 K in new continuing annual institutional capital funds to combine with existing funds to invest a total of \$2 M by FY08 for renovations of research and teaching space in the Engineering Center.
- Expansion of the existing Engineering Center by 40,000-60,000 square feet by FY08 for research and office space to support new research centers and initiatives, including the establishment of at least two specialized research facilities shared across multiple departments. Private fundraising of approximately \$20 M will be required, with another \$6 M sought from institutional funds.

## 4. How Will We Get There?

To achieve our broad objectives and specific goals related to research, education, and resource development, a tactical plan that includes the action items and responsibilities listed below will be undertaken over the next five years.

### 4.1 Research Excellence

Action Item	Person(s) Responsible	Target Date(s)
Respond to national initiatives in interdisciplinary areas of core and emerging strengths, by college faculty increasing the number of multi-investigation proposals for at least \$1 M each by 10% per year, from the FY03 baseline of 57, including targeted federal programs such as ERC, ITR, MRSEC, NIRT, STC, Homeland Security, etc. Form a Faculty Research Council to identify and catalyze these efforts.	Assoc. Dean Stein Sture (coordinate); Faculty Research Council	Annual FY04: Fac. Res. Council formed
Provide seed funding of \$10 K by the college to establish and nurture each approved new interdisciplinary research center, including opportunities in cybersecurity, unmanned aerial vehicles (UAVs), nano/optoelectronics, interdisciplinary telecommunications, transportation, and other areas of faculty strength and initiative (e.g., materials, bioengineering).	Assoc. Dean Stein Sture (coordinate); Alex Wolf (cybersecurity); George Morgenthaler (UAVs); Ross Corotis (transport); Bart VanZeghbroeck (nano/optoelectronics); Tim Brown (telecom)	FY04: UAVs & cybersec. FY05: telecom & transport FY06: nano/opto FY07: other
Identify leading experts in strategic areas of emphasis and recruit them for faculty leadership roles in major research initiatives, with competitive salaries and startup/transition packages. In addition to regular faculty, include targeted recruitment of research faculty from industry and government labs.	Dept. Chairs; Dean Rob Davis (oversight); EAC & RDC (identify pot. res. fac.)	Annual
Strengthen core and emerging research programs and support for graduate students, by college faculty increasing the total number and value of proposals submitted by 10% per year, from the FY03 baseline of 554 proposals for \$273 M.	All faculty; oversight by Assoc. Dean Stein Sture & Dept. Chairs	Annual
Develop a college program with funding of at least \$35 K per year to support faculty travel to funding agencies.	Assoc. Dean Stein Sture & Dean's Asst. Araceli Warren	FY04
In cooperation with faculty in other schools and colleges, submit educational, research and business plans to the Provost and Chancellor for major campus-wide or system-wide initiatives in emerging areas such as assistive technologies, biotechnology, homeland security, information science & technology, and micro/nanotechnology.	Dean Rob Davis & Assoc. Dean Stein Sture (oversight); Kristi Anseth (biotech); Roop Mahajan (micro/nano); Bobby Schnabel (info tech); Alex Wolf (security)	FY04: bio. & micro/nano FY05: info & security FY06: asst. tech
Through the Discovery Learning Center and interdisciplinary research centers, invite additional partnerships with industry, and with other universities and government laboratories, to enhance interdisciplinary research, with at least 15 corporate visits per year.	Assoc. Dean Stein Sture (oversight); George Morgenthaler (DLC); Center Directors; Pat Sullivan (corp. rel.); EAC & RDC (contacts)	Annual
Provide an inspirational culture of excellence, along with expectations and incentives to reinvigorate the performance of faculty with low or modest research productivity. Develop department-based faculty fellowship programs to provide temporary teaching release to build research. Establish recognition and awards programs.	Administrative Council of Chairs & Deans	Annual

## 4.2 Educational Excellence

Action Item	Person(s) Responsible	Target Date(s)
Develop effective marketing tools of the college and its departments and programs to its constituents (prospective students, prospective employers, funding agencies, donors, peer institutions, evaluators, etc.), including brochures, publications, fliers, websites, and presentations. Materials will include communications to students about alumni excellence and contributions in leadership, service, and technology.	Comm. Dir. Carol Rowe; Comm. Assoc. Holly Kleinman; Dean Rob Davis; Eng. Dev.; Alumni	Annual
Establish a college-wide <i>Discovery Learning Initiative</i> (as embodied in the Discovery Learning Center) to expand undergraduate research through senior thesis, independent study, Research Experiences for Undergraduates (REU) grants, and partnering with the campus-wide Undergraduate Research Opportunities Program (UROP) and Undergraduate Research Assistantships Program (URAP). Hire a Director of Academic Programs and Assessment, who will provide program coordination, leadership and evaluation and oversee an annual discovery-learning symposium and awards ceremony in the DLC.	Faculty; DLC Directors George Morgenthaler & JoAnn Zelasko; Dir. Acad. Prog.	FY04: hire director FY04: estab. DLI & symp.
Establish a college-wide <i>Service Learning Initiative</i> to expand student involvement in K-12 outreach, community service and projects for developing communities, leadership roles, course assistance, tutoring, etc. Create an <i>Earn-Learn Program</i> (ELP) to provide financial support for students engaged in service learning. Hire a Director of Academic Programs and Assessment to coordinate service projects, earn-learn opportunities, and professional programs	Faculty; Dean Rob Davis; Assoc. Dean John Bennett; Eng. Dev. & RDC (Earn-Learn fundraising); Dir. Acad. Prog.	FY04: hire director FY04: fundraise for ELP FY05: start SLI
Establish a college-wide <i>Professional Learning Initiative</i> to expand professional opportunities (internships, co-op, etc.) and career advising for students and to better prepare them for professional engineering practice. Also, strengthen industry involvement in the educational mission through participation & sponsorship of capstone design projects, guest lectures, shadowing, internships & co-operative education programs.	Faculty; Dir. Acad. Prog.; Career Serv.; Bev Louie (co-op adv.); Ext. Advisory Committees & Alumni (opportunities)	FY05: PLI Annual: indus. involvement
Enhance student learning through curricula enriched in humanities, writing, ethics, hands-on learning, team-based projects, and capstone design, in addition to math, science and engineering fundamentals. Hire additional instructional faculty and teaching assistants and strengthen the Undergraduate and Graduate Education Councils to catalyze these efforts. Provide for annual assessment and ongoing educational improvements and full accreditation.	Faculty; Assoc. Dean John Bennett (oversight); Ugrad. & Grad. Educ. Councils; Herbst Dir. Wayne Ambler (humanities); Dir. Acad. Prog. (assess. & accred.)	FY05-FY07: hire inst. faculty & TAs Annual: enrich. curr.
Establish a faculty sub-committee to consider the appropriate role of biological science in the basic undergraduate curriculum and make recommendations to the college faculty for implementation.	Assoc. Dean John Bennett (coor.); Ugrad. Educ. Council; Faculty	FY04: est. comm. FY05: recomm. and approval FY06: implement
Improve recruitment of students by revising undergraduate admissions procedures with a proactive role of college personnel, using a recent survey of the applicant pool to guide action to improve diversity and quality of entering students, partnering with community and state colleges, coordinating graduate recruitment with college support of faculty visits to targeted schools and a research fair for visiting students, and improving the college web site for both prospective and current students.	Assoc. Dean John Bennett (oversight); Outreach & Educ. Dir. (survey & partnering); Asst. Dean Jim Sherman (admissions); Grad. Directors (grad. rec.); Comm. Dir. Carol Rowe (web site and comm.); Faculty, EAC & RDC (contact pros. students)	FY04: web site FY04-FY05: adm. proc. Annual: grad. rec., survey, partnering

Establish a college-wide <i>Engineering Outreach Program</i> , building on current efforts by ITLL, MEP, WIEP, Space Grant, and other programs/departments. K-12 outreach activities will be expanded with emphasis on underrepresented student groups (women, minorities, first-generation college students, and those from rural communities), including summer programs for students and teachers, K-12 science and engineering curriculum development, outreach corps of CU students and faculty, and a mobile laboratory for demonstrations. A Director of Outreach and Education will provide coordination and assessment, and oversee submission of outreach grant proposals (3 or more per year).	Faculty; Assoc. Dean John Bennett (oversight); Dir. Outreach & Educ. (coord.); ITLL Directors Larry Carlson & Jackie Sullivan; MEP Dir. Dave Aragon; Sp. Gr. Dir. Elaine Hansen; WIEP Dir. Bev Louie; Alumni	FY04: hire dir. FY05: est. rural prog. & outreach corps Annual: K-12 curr., sum. prog., ext. grant prop.
Establish a college-wide <i>Engineering Honors Program</i> , to provide a vehicle to assist in recruiting and retaining exceptionally strong students and in enriching their education. The curriculum for this program will be developed with continuing interaction with alumni to ensure that it reflects the rapidly changing needs and opportunities in our field. Participating students will be encouraged to continue their connection with the program after graduation.	Assoc. Deans John Bennett & Stein Sture (oversight); Ugrad. Educ. Council & Dept. Chairs (coord.); Alumni	FY05
Develop a college-wide <i>Engineering Advising Program</i> , with a Director hired to advise and support first-year students and to work with departments and programs to ensure effective advising at all levels.	Asst. Dean Jim Sherman (hiring and oversight); Dir. Eng. Adv. (coordination)	FY05: hire director FY05-FY08: prog. impl.
Increase graduate training and support opportunities by submitting at least ten graduate training proposals per year to federal programs such as NSF IGERT, DoEd GAANN, and NIH biotechnology and bioengineering training grants, and working with campus administration on revised non-resident tuition policies.	Assoc. Dean Stein Sture (oversight); Grad. Prog. Directors (proposal prep.); Dean Rob Davis (non-res. tuition)	Annual

### 4.3 Resource Excellence

Action Item	Person(s) Responsible	Target Date(s)
Hire outstanding and diverse candidates through targeted recruitment, competitive salaries and startup packages, and compelling opportunities to participate in excellent research and educational programs.	Faculty search committees; Dept. Chairs; Dean Rob Davis	Annual
Retain top faculty through merit-based raises, endowed faculty positions, infrastructural support, and building communities of colleagues with common interests.	Admin. Council of Chairs & Deans	Annual
Form a college-wide <i>Engineering Awards Committee</i> , in addition to department-based awards committees, and actively nominate top faculty for campus and national awards, fellow status in professional societies, and membership in national academies.	Dean Rob Davis & Assoc. Dean Stein Sture; Dept. Chairs; Faculty Awards Committees	Annual
Develop a faculty culture of excellence and collaboration through uniformly high standards in hiring, annual reviews, and reappointment/promotion/tenure/post-tenure reviews, a <i>New Faculty Program</i> to provide guidance and mentoring for pre-tenure faculty, rewards for excellence, a <i>Faculty Excellence Program</i> to provide ongoing training in teaching/research/management excellence, merit-based salary administration, leadership opportunities and cross-departmental communities of colleagues with common scholarly interests.	Dean Rob Davis & Zoya Popovic (new fac. prog.); Dean Rob Davis & Assoc. Deans John Bennett & Stein Sture (fac. exc. prog.); Deans, Chairs & Faculty (hiring & culture)	FY04: new fac. prog. FY05: fac. exc. prog. Annual: ongoing efforts
Cultivate alumni involvement through advisory boards, development visits, alumni events, project and seminar courses, and professional-learning opportunities.	Deans & Dept. Chairs (boards, courses, events); Eng. Dev. Staff (visits, events); Dir. Acad. Prog. (prof. learning)	Annual

Review, reallocate and renovate existing research and educational space in the Engineering Center for more effective use, including deployment of modern communication and computing technologies.	Asst. Dean JoAnn Zelasko (oversight); Admin. Council of Chairs & Deans	FY04-FY06: reall. & renov.
Move two college tenants to nearby Exabyte building (e.g., the Center for Advanced Decision Support for Water & Environmental Systems (CADSWES) and the proposed Micro/nanotechnology Centralized Characterization & Fabrication Facility).	Asst. Dean JoAnn Zelasko (oversight); Edie Zagona (CADSWES); Roop Mahajan (micro/nano)	FY04: CADSWES FY05: micro/nano
Develop feasibility assessments, program plans, and fundraising efforts to expand at least three wings of the Engineering Center by 10,000 – 30,000 sq. ft. each.	Asst. Dean JoAnn Zelasko (oversight); Dept. Chairs (plans); Dev. Dir. Marc Thompson & Dean Rob Davis (fundraising)	Complete expansions in FY06, FY07 & FY08
Complete needs assessment and program and business plans for at least two college research facilities, request funding from campus and federal government, and establish the facilities (tentatively, a micro/nano facility is being planned).	Assoc. Dean Stein Sture & Asst. Dean JoAnn Zelasko (oversight); Roop Mahajan (micro/nano)	FY05: micro/nano estab. FY06: second estab.
Work with the Provost, Chancellor, and students in the college to promote <i>Quality for Colorado</i> and differential tuition and lab fees, to provide \$5.6 M in new continuing annual institutional support (post-inflation) by FY08 to improve educational and faculty quality in the college (see Section 3.2.3 for details), plus another \$1.2 M in continuing annual institutional support for new building projects.	Dean Rob Davis; Asst. Dean JoAnn Zelasko	FY04-FY08: Qual. Colo. FY05-FY08: diff. tuit. FY05: lab fees
Intensify private fundraising efforts by adding three development staff (to five current) and allocating 50% time of each development officer to face-to-face contacts, resulting in <ul style="list-style-type: none"> <li>• 1500 face-to-face contacts, with a 10% success rate in major (&gt; \$25 K) gifts</li> <li>• 40 dean/leadership donor visits per year, with a 20% success rate in major gifts</li> <li>• 12,000 mail/email/phone contacts of alumni, with a 33% success rate (as measured in follow-up visits and/or gifts)</li> <li>• targeted efforts for obtaining support from foundations and corporations, with success measured by at least one new gift or pledge of \$250 K or more per year</li> <li>• fundraising goals established and a development officer assigned for each department and program</li> <li>• \$12 M per year in new gift support (see Section 3.2.3 for detailed goals), up from \$9 M in FY03</li> </ul>	Dev. Dir. Marc Thompson & Eng. Dev. Staff; Pat Sullivan (foundations & corporations); Dean Rob Davis; Assoc. Deans John Bennett & Stein Sture; Asst. Dean JoAnn Zelasko; Dept. Chairs & Prog. Directors; Faculty; RDC	FY04: hire new staff Annual: ongoing efforts

## 5. Moving Ahead

This document outlines lofty goals for expanding our research programs, enriching the educational experience of our students, increasing the quality and diversity of our students and faculty, and raising the necessary supporting resources. Achieving these goals will require the cooperative efforts of all of our partners: faculty, staff, students, parents, alumni, donors, advisory councils, corporations, funding agencies, state and federal government, and the campus and university administration. The Dean's Office and Administrative Council will provide the leadership and structure so that all members of our college community will be supported in meeting these goals. The result will be achievement of the highest levels of excellence in education, research, students and faculty, so that our college is a widely recognized model program for others around the nation and internationally. We invite you to join us in taking up this challenge. Together, we can go farther!



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