

**Summary and Recommendations from the 4/25/08
Meeting of the Engineering Advisory Council
Robert H. Davis, Dean**

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

This report summarizes the key findings and recommendations of the Engineering Advisory Council (EAC) meeting on 25 April 2008. This report and presentation slides are archived at:
http://engineering.colorado.edu/overview/advisory_boards.htm.

1. Introductions & Announcements

EAC Chair Vern Norviel introduced Jim Gallogly (ConocoPhillips), the new member of the EAC. Three departing members (Gary Jacobs, Fred Kitson, George Sissel) were recognized for their service. Dean Rob Davis then congratulated several EAC members: Dereje Agonafer (Thermi Award), Jill Tietjen (published book: "Her Story"), Lucy Sanders (Women in Technology Hall of Fame), Kristy Schloss (SWE Entrepreneurship Award), and Jim Voss (appointed VP of Engineering, SpaceDev). He also previewed the Distinguished Engineering Alumni Awards presented at the evening banquet: Gary Anderson (EAC member), Kristi Anseth, Peter Mannetti (EAC member), John McMasters, and Sami Miro. Vern Norviel then repeated his request from the prior EAC meeting:

- *Each EAC member should send him (vnorviel@wsgr.com) one potential prospect for supporting the Systems Biotechnology Building.*

Later in the meeting, Ann Scott thanked several EAC members who helped with alumni events or sending letters to prospective donors: Mike Herriage, Ray Kolibaba, Bob Krebs, Nan Joesten, Gary Anderson and Lanny Pinchuk.

2. College Updates

Dean Rob Davis gave a college update in the form of 10 recent highlights:

- (i) Bernard Amadei elected to the National Academy of Engineering
- (ii) Larry Carlson and Jackie Sullivan won the Gordon Prize from the National Academy of Engineering
- (iii) Kristi Anseth was named a CU Distinguished Professor
- (iv) John Falconer won CU-Boulder's Hazel Barnes Prize
- (v) Four mechanical engineering faculty won DARPA young investigator awards (the most from any school in the country)
- (vi) New centers were launched in biofuels and wind energy
- (vii) An *Entrepreneurship Program* and *Engineering Redshirt Program* are being formed
- (viii) The *Systems Biotechnology Building* received state approval
- (ix) Engineering fundraising has met its \$5 million goal for the fiscal year and I-CUE is nearing its \$1.5 million goal
- (x) Outreach efforts are advancing, with all graduating seniors of the Denver School of Science and Technology accepted to 4-year colleges and a CU/Mesa State engineering program approved

Comments and recommendations from the EAC members include

- 60-70% of the engineering workforce in the energy sector is eligible to retire within 10 years – how will we recruit more students, especially from underrepresented groups?
- EAC members would like to be involved in calling prospective students
- Include entrepreneurship in biotechnology research endeavors

3. Campus Update

Provost Phil DiStefano gave a campus update, focusing on the recently published *Flagship 2030* strategic plan. He provided a handout listing 8 core and 10 flagship initiatives (the plan can be found at <http://www.colorado.edu/flagship2030>). Some themes that he highlighted include interdisciplinary research, globalization, year-round learning, and Colorado Research Diamond (universities, business, state government, and federal laboratories). Mike Wirth noted that 18 initiatives is a lot and asked what should we not do? Phil responded that some courses and programs will be cut. He also said that funds will be allocated selectively for implementation, and that costsharing will be a key element.

4. Strategic Planning

Dean Rob Davis gave a short overview of the status of strategic planning, noting that the college faculty and staff had held miniretreats during the semester on the themes of people, places and programs. The EAC members then participated in small-group, café-style discussions of strategic-planning questions in each of these three areas. At the end of each 15-minute discussion period, each EAC member completed a questionnaire. A summary of results is provided below. In parentheses is given the percentage of respondents making the given choice.

People

- (i) How do you expect that the hiring of U.S. engineering graduates in your sector will change in the next 10-15 years?

	decrease by at least 20%		remain flat		increase by at least 20%	Average Score
BS	1 (0%)	2 (4%)	3 (4%)	4 (55%)	5 (37%)	4.3
MS	1 (0%)	2 (0%)	3 (15%)	4 (44%)	5 (41%)	4.3
PhD	1 (0%)	2 (0%)	3 (44%)	4 (26%)	5 (30%)	3.8

- (ii) What should our college's role be in attracting and preparing K-12 students for engineering study?

passive		current level of activity		increased level of activity	Average Score
1 (0%)	2 (7%)	3 (11%)	4 (14%)	5 (68%)	4.4

- (iii) How attractive to potential donors are the following needs?

	low		medium		high	Average Score
Undergraduate scholarships	1 (0%)	2 (0%)	3 (21%)	4 (29%)	5 (50%)	4.3
Graduate fellowships	1 (0%)	2 (15%)	3 (48%)	4 (22%)	5 (15%)	3.4
Earn-learn apprenticeships	1 (0%)	2 (4%)	3 (15%)	4 (29%)	5 (52%)	4.3
Junior-level faculty fellowships	1 (4%)	2 (18%)	3 (52%)	4 (22%)	5 (4%)	3.0
Endowed chairs & professorships	1 (0%)	2 (15%)	3 (37%)	4 (33%)	5 (15%)	3.5
Teaching professorships	1 (4%)	2 (18%)	3 (48%)	4 (26%)	5 (4%)	3.1

EAC members expect growth in hiring of engineers at all levels, more so for BS and MS than PhD students. They also urge the College to continue and increase its outreach efforts to prepare and interest K-12 students in engineering. Undergraduate scholarships and earn-learn apprenticeships are seen as more attractive to donors than is support for graduate students and faculty. Several individuals commented on the importance of partnerships with high schools to increase student interest in engineering.

Places

(i) How important are the following considerations to the effectiveness of our college?

	low		medium		high	<i>Average Score</i>
Dorms within walking distance to classrooms?	1 (4%)	2 (19%)	3 (31%)	4 (27%)	5 (19%)	3.4
Engineering departments within walking distance to science departments?	1 (0%)	2 (0%)	3 (19%)	4 (35%)	5 (46%)	4.3
Research laboratories in close proximity to faculty offices and classrooms?	1 (0%)	2 (4%)	3 (14%)	4 (39%)	5 (43%)	4.2
A low-density campus with trees and grass areas?	1 (7%)	2 (22%)	3 (41%)	4 (19%)	5 (11%)	3.0
A football stadium on the main campus?	1 (43%)	2 (21%)	3 (21%)	4 (4%)	5 (11%)	2.2
All engineering departments in a single complex?	1 (15%)	2 (26%)	3 (30%)	4 (7%)	5 (22%)	3.0

(ii) To accommodate future growth in the next 10-20 years, how attractive are the following possibilities?

	low		medium		high	<i>Average Score</i>
Expand the current engineering center	1 (8%)	2 (4%)	3 (32%)	4 (20%)	5 (36%)	3.7
Move all engineering and some science to east campus	1 (8%)	2 (24%)	3 (28%)	4 (28%)	5 (12%)	3.1
Retain current building but use east campus for growth	1 (12%)	2 (20%)	3 (28%)	4 (24%)	5 (26%)	3.1
Hold more classes on evenings, weekends and summer	1 (4%)	2 (4%)	3 (20%)	4 (36%)	5 (36%)	4.0

EAC members noted the importance of the proximity of labs, classrooms and faculty offices and of engineering departments within walking distance of science departments, more so than all engineering departments in a single complex. To accommodate future growth, holding more classes on evenings and during summer ranked as the top choice, and expanding the current engineering center was recommended over building on the east campus. Individuals commented that classes should not be on weekends, that technology and transportation could link the main and east campuses, and that an important consideration is whether just more or also better space is needed to make revolutionary vs. evolutionary change to the College.

Programs

(i) How important are the following content and paradigms to engineering education and research in the next 10-15 years?

	low		medium		high	Average Score
Fundamentals	1 (0%)	2 (4%)	3 (0%)	4 (7%)	5 (89%)	4.8
Hands-on experiences	1 (0%)	2 (0%)	3 (11%)	4 (37%)	5 (52%)	4.4
International experiences	1 (4%)	2 (18%)	3 (41%)	4 (30%)	5 (7%)	3.2
Interdisciplinary education & research	1 (4%)	2 (4%)	3 (14%)	4 (52%)	5 (26%)	3.9
Teamwork	1 (0%)	2 (0%)	3 (8%)	4 (34%)	5 (58%)	4.5
Communications	1 (0%)	2 (4%)	3 (11%)	4 (30%)	5 (55%)	4.4
K-12 engineering education	1 (4%)	2 (4%)	3 (22%)	4 (44%)	5 (26%)	3.8
Engineering for society	1 (0%)	2 (30%)	3 (30%)	4 (18%)	5 (22%)	3.3

(ii) How important are the following technical areas for engineering research and education in the next 10-15 years?

	low		medium		high	Average Score
Bioengineering & biotechnology	1 (0%)	2 (0%)	3 (4%)	4 (18%)	5 (78%)	4.7
Computational & communications technologies	1 (0%)	2 (8%)	3 (8%)	4 (50%)	5 (34%)	4.1
Energy & environmental sustainability	1 (0%)	2 (0%)	3 (0%)	4 (27%)	5 (73%)	4.7
Materials science & engineering	1 (0%)	2 (4%)	3 (19%)	4 (31%)	5 (46%)	4.2
Space systems science & engineering	1 (4%)	3 (4%)	3 (7%)	4 (52%)	5 (33%)	4.1

EAC members ranked fundamentals as the most important aspect of engineering education and research, followed closely by teamwork, hands-on experiences, and communication skills. In terms of technical areas, bioengineering and biotechnology along with energy and environmental sustainability were ranked at the top, while materials science and engineering, computational and communications technologies, and space systems science and engineering also scored high. Individual comments include that nuclear engineering should be considered and that we should not do everything and need criteria for what to include.

Clicker Responses

After lunch, EAC members used “clickers” to vote electronically on four questions. The tally is given below.

- (i) Provided that student quality and diversity can be maintained or increased, should our college . . .
 - A. Maintain its current enrollments? (0 votes)
 - B. Grow enrollments by approximately 10% total over the next 10-15 years? (6 votes)
 - C. Grow enrollments by approximately 20% or more over the next 10-15 years? (13 votes)

- (ii) Should extracurricular active-learning experiences (such as earn-learn, research projects, summer abroad, engineering for developing communities, and internships) be required of all undergraduates?
 - A. No, they should be encouraged but not required. (5 votes)

- B. Yes, at least one semester-long or summer-long experience should be required prior to graduation. (12 votes)
 - C. Yes, at least two semester-long or summer-long experiences should be required prior to graduation. (2 votes)
- (iii) Which of the following is most important to emphasize in undergraduate education?
- A. Fundamentals of math, science and engineering. (19 votes)
 - B. Practical experiences related to engineering. (0 votes)
 - C. Oral and written communication skills. (1 vote)
 - D. Societal and ethical aspects of engineering. (0 votes)
 - E. Teamwork and leadership. (1 vote)
- (iv) Which of the following is the second most important to emphasize in undergraduate education?
- A. Fundamentals of math, science and engineering. (1 vote)
 - B. Practical experiences related to engineering. (6 votes)
 - C. Oral and written communication skills. (8 votes)
 - D. Societal and ethical aspects of engineering. (0 votes)
 - E. Teamwork and leadership. (5 votes)

These results support the earlier discussions, and include recommendations to increase enrollments and to maintain a strong focus on fundamentals while also providing opportunities for oral and written communications, practical experiences, and teamwork and leadership. Members also supported a requirement for at least one semester-long or summer-long active-learning experience outside of the regular curriculum, in support of one of the *Flagship 2030* campus initiatives.

5. International Programs

Sherry Snyder, Director of Student Programs, gave an overview of *International Engineering Certificates*, which include language and culture training plus an overseas corporate or university experience. Kendria Alt, a BS/MS student in Aerospace Engineering Sciences, described her study abroad and international internship in Germany. Christina Barstow, a senior in Civil Engineering, described her project in Rwanda with *Engineers Without Borders*, as well as a low-gravity flight experiment she performed with NASA.

6. Subcommittees

The subcommittees met after lunch, and Dean Rob Davis asked that they include strategic planning in their discussion. Subsequent reports from the subcommittees are provided below.

6.1 Education and Outreach Committee (EOC)

The subcommittee started with updates on specific items from the Fall 2008 meeting:

- Several committee members referred to the Freshman Redshirt Program as a “great program.” The phase-1 pilot will start in the Fall 2008 semester, with a “mature” kickoff in Fall 2009. The program will emphasize excellence and not just focus on delivering “bridging courses.” Fundraising is needed; current success and ongoing efforts include gifts from Jim Patterson and David Clair (former EAC members!) and a NSF Innovation in Engineering Education proposal.
- The Mesa State College (MSC) MOU and implementation plan are completed. An information session was held at MSC in February. The program will offer a BS degree in mechanical engineering. UCB will hire a MSC program director. The degree will be from UCB. UCB and MSC will work together on accreditation.
- DSST announced that 100% of the first graduating class (79 students) was accepted into 4-yr colleges and universities. Twenty-five percent of these students are accepted to engineering programs. Eight students confirmed at CU Engineering, including the class valedictorian, plus one deferred to next year. DSST reported the fifth-highest standardized test scores of Colorado high schools (tied with Cherry Creek).

- Undergraduate and Graduate Engineering Entrepreneurship (Eship) Certificate Programs have been initiated. Goals are to integrate business education into engineering education programs. Forty-two sophomores are registered for Fall 2008 start.

The committee moved to a discussion of current strategic planning. Discussion focused on the potential impact of the proposed Amendment 46 and the goals for K-12 outreach. Some conclusions are:

- Amendment 46 would effectively eliminate "affirmative action" selection criteria.
- The major impact would be on admissions and scholarships; Native American tribal-based selection criteria would not be affected.
- Our college will likely need to reorganize and rename programs.

In response to the committee's request to arrange a MEP/WIEP student event, a "mixer" with several students and committee members was conducted after the EAC meeting. The event included exercises to maximize the interactions of students and committee members.

Recommendations and actions:

- *Prioritize critical items for targeted fund raising for the Engineering Redshirt Program; explore a work-study program*
- *For the CU-MS program, determine how demographic data will be interpreted. Will we count URM at MSC as part of UCB totals? Will accreditation ensure consistency/quality of the degree?*
- *The Eship programs should engage local entrepreneurial support programs such as TechStars*
- *Participate in the upcoming Amendment 46 training session and consider support for an Amendment 46 counter initiative*
- *Revisit the goals and objectives of K-12 outreach for the strategic plan; specifically determine alignments with the 18 goals for the Flagship 2030 plan; pursue more direct industry involvement*

6.2 Resource Development Committee (RDC)

Introductions

Jim Gallogly was introduced by Gary Anderson as the new member of the RDC.

Development Updates

Gary Anderson again welcomed Jessica Wright Bowen as Senior Director of Development. Gary noted that she has now been with the College for six months and has the right skill set to bring more organization and continuity to the development effort and is committed to staying. Jessica is actively looking for someone to fill the opening in corporate and foundation relations created by the departure of Pat Sullivan to another CU Foundation posting. Jessica is also getting close to hiring someone for the open Associate Director of Development spot. Lanny Pinchuk mentioned that the staff would likely double in preparation for the campaign. Gary suggested that two things had changed at the Foundation, which would allow for greater success in development. The Foundation has focused its efforts not just on efficiency and managing the bottom line, but also on investing to produce results.

I-CUE Update

Rob Davis provided an update on I-CUE. The I-CUE campaign has reached \$1.4 million in funds raised as compared to its goal of \$1.5 million by June 30, 2008. The EAC members have collectively given \$255,000 to support I-CUE, and the EAC Pooled Scholarship fund is at \$96,000 compared to its goal of \$100,000. An EAC member said at the meeting that he would write a check that would allow the pooled fund to reach its goal. The mailing to 430 alums resulted in twenty-two gifts and \$73,000. This represents a 5% participation level, which is typical for such a mailing.

Systems Biotechnology

Rob Davis provided an update on the Biotechnology Initiative. Art Dawson, Associate VP for fundraising for the initiative, is working with the chancellor and the president of the University to raise \$50 million for the building and \$200 million for the associated programs. Tom Cech has committed to return to CU-Boulder and help with the biotechnology effort, and this decision has been an inspiration for the

fundraising effort. Marv Caruthers has given the lead gift for the building, and an effort is underway to securing more gifts from people who worked with him at CU and who also have succeeded in their biotechnology firms. The goal from that group is three smaller gifts totaling \$6 million, and the prospects look good. The chancellor is committed to working on fundraising for the initiative and is working with Marv Caruthers, Leslie Leinwand and Tom Cech to secure help from the mayor, governor and others with dinners held in Colorado, New York and Washington, DC. A discussion ensued about the state legislature and also about the possibility of making an appeal based on the role that the initiative would play in economic development.

Energy Initiative

Jessica Wright provided an update on the Energy Initiative. The two initial campus and statewide programs are both CU Engineering initiatives: the Colorado Center for Biorefining and Biofuels (C2B2) and the Center for Research and Education on Wind (CREW).

Fundraising and Campaign Overview

Rob discussed how he mapped his campaign goal of \$130 million over seven years to the chancellor's "Flagship 2030" strategic plan. He discussed the possible move to east campus and the need for a campus-level plan. Rob mentioned the \$40 million aerospace expansion, one third of which will be derived from private funds. An ITL addition was also mentioned. There was a discussion of the queue in state appropriations for the various initiatives, and Rob said that the biotechnology initiative was at the top of the campus requests for FY10 and the aerospace expansion was third (since moved to second). There was a discussion of the timing of capital initiatives—that they can start slow and the suddenly rapidly advance, depending on private support. He offered Anschutz as an example, since it started as a 50-year project but, after just a few years, is well on its way to completion.

Gary Anderson presented a chart that showed the amount of funds raised for the College over the last several years. He expressed concern that the College had previously been the flagship in terms of raising funds but had floundered lately. He suggested that an investment in development would allow the College to tap alums with higher average earnings than ever before. A lengthy discussion ensued about alumni giving participation levels and how best to appeal to alumni. It was recommended that the development effort include securing commitments for support in the early years after graduation, even though the majority of funds will likely come from a few large gifts from older alumni.

The figures for alumni participation were presented: only 6% of alumni give in any one year. Jessica Wright Bowen, Nan Joesten and others suggested that, given the needs of the campaign for \$130 million, the focus of the fundraising efforts would have to be on the potential for very large gifts from a small population of alumni donors with the capacity to make significant contributions, rather than on small gifts from the general alumni population.

Jim Gallogly said that requests for significant gifts from corporations should be very specific, tailored meticulously with timelines and definite goals, the steps to reach those goals, and explanations about the importance and impact of proposed gifts and how they connect with corporate needs. He suggested providing more than one option in each request. It was also noted that a segmented approach is needed (for different giving levels, departments and programs, and donor demographics).

A discussion ensued about the annual calling program and how a call can be unpleasant, even for an alumnus who already gives. George Sissel said that he would be willing to promise a certain annual amount to get off the annual calling list. Jim Gallogly said that public schools don't typically ask for annual funds and Vern Norviel said that there should be "forever email" addresses at colorado.edu for every alumnus of the college.

Wrap-up and Action Items:

Gary wrapped up with a summary of the meeting. Recommendations and actions include:

- *Continue to involve faculty in fundraising*
- *Build alumni support and giving in their early years*
- *However, fundraising efforts for the campaign will need to focus on very large gifts from a smaller population with capacity*
- *Expand use of email and consider colorado.edu 'forever' address*
- *Give option to regular donors to be removed from annual calling campaign*
- *Decision process involving campus is needed on whether engineering moves to east campus in future*

6.3 Research and Corporate/Government Relations Committee (RCRC)

In response to previous RCRC requests, Chris Bowman presented an update on college funding and research efforts, particularly as they relate both to NSF funding connected to industry (about 10% of our NSF funding) and federal funding that comes through industrial grants such as SBIRs or STTRs (a little over \$3M, or 30% of our industrial funding). He also reviewed the status of major center proposals (ERC and MRSEC) in the College and discussed his meeting with NSF personnel in regards to the rejection of CU's ERC proposals. Research metrics for the College, its faculty, and the departments were also reviewed, as were the strategic-planning activities, particularly those focused on research and corporate relations.

A document generated by Kate Tallman from Technology Transfer and representing a collection of frequently asked questions (and answers!) for how corporations can best interact with the University of Colorado was distributed and discussed. This document was generally viewed positively. A job description for the Washington liaison position was distributed and discussed briefly as well. These documents both require input from members of the RCRC prior to finalization.

Discussion of the importance of more critically evaluating opportunities in research areas that have arisen in the strategic plan focused on the creation of teams of individuals to include members of the RCRC as well as CU faculty members. These teams are to be tasked with generating "white paper" summaries of the opportunities in each of these areas as input to the strategic plan.

Recommendations and action plans from the RCRC meeting include

- *Vetting of the corporate FAQ document that was generated by technology transfer by members of the RCRC should occur, with responses collated by Chris Bowman and discussed with Technology Transfer*
- *Vetting of the Washington liaison job description should occur, and a final job description arrived at with a goal of initiating the search prior to the fall EAC meeting*
- *Committees consisting of EAC members and CU faculty will be put together to create white-paper summaries of opportunities within each of the critical research themes previously identified in the strategic planning activity*

7. Economic Development

The session on economic development started with a PowerPoint presentation by Jim Gallogly, Senior VP for ConocoPhillips and the newest member of the EAC. Jim started with an overview of ConocoPhillips, the third-largest integrated energy company in the United States and with over 30,000 employees worldwide. He also noted the importance of Colorado to the U.S. energy future, including natural gas, oil shale, and renewable energy. Jim then described the Technology and Learning Center that ConocoPhillips plans to build by 2012 on 400 acres in Louisville, CO. It will include research and development for both renewable energy and fossil fuels and a corporate training center. Colorado was chosen as an expansion from the company's roots in Oklahoma and Texas and because of its expected role in the nation's energy future and the existing and potential relationships with Colorado's research universities and government laboratories, including participation in the Colorado Center for Biorefining and Biofuels (C2B2) hosted by our college. Dean Rob Davis thanked Jim for his presentation and also for

the \$100,000 check that he delivered that day to signal support of and partnership with our college by ConocoPhillips.

Don Elliman, Director of the Colorado office of Economic Development, then spoke on state priorities for economic growth. The governor has selected four strategic priorities: aerospace, biosciences, energy, and tourism. With respect to energy, there is strong interest by one or two major wind-energy companies locating in Colorado, in addition to integrated companies such as ConocoPhillips. Don noted that he is hopeful that the team involving CU will win the new contract to manage the National Renewable Energy Laboratory (NREL). He also cited our college's key role in new research centers in biofuels, wind energy, and solar energy, with state support through the Colorado Energy Collaboratory. Don said that we need to grow engineering enrollments, connect with businesses, and help sell the value of education to improve the quality of labor, life, and the economy. Merc Mercure noted that Colorado has many small and medium-sized businesses that want local talent, making higher education all the more important for the State. Vern Norviel recommended that the State consider a game-changing approach, such as selling bonds to support health research.

8. Concluding Business

It was decided that a closed meeting of the EAC members was not needed this time, but maybe next time. Next year's EAC meetings are scheduled for 9/26/08 and 4/24/09. There is no longer a home football game following the Fall 2008 EAC meeting due to a late change in the football schedule. Final recommendation includes:

- *Include strategic plan report at next EAC meeting*
- *Focus on excellence in the strategic plan ('good' is the enemy of 'great')*
- *Consider closed session at next EAC meeting*
- *Better coordination of student recruiting is needed*
- *Include engineering portion of capital campaign at the next EAC meeting*

EAC members in attendance

D. Agonafer, G. Anderson, B. Bauer, J. Becker, B. Buckland, K. Coyne, P. Drew, F. Figueroa, J. Gallogly, D. Hernandez, M. Herriage, N. Joesten, R. Kolibaba, R. Krebs, J. Liebman, P. Mannetti, M. Mercure, J. Negler, V. Norviel, L. Pinchuk, F. Prager, A. Sanders, L. Sanders, K. Schloss, G. Sissel, G. Slaff, J. Voss, M. Wirth, R. Zimmerman