April 15, 2005

Knowledge to Go Places

Industrial Associates Board
Spring 2005

Dr. Tony Maciejewski

Providing a World-Class Education for Today's Global Society
Welcome

Introducing our new members and visitors ...

• Warner Andrews
• Brian Arnold
• Andy Denenberg
• Joel Edwards
• Dave Henderson
• Alvin Loke
• Mike Noonan
• Ernesto Wiedenbrug
• Gary Zeigler
Today’s Theme

Providing a World-Class Education for Today’s Global Society
Agenda

• Department Update
• Update on Fall Action Items & Meeting Recap
• Realizing America’s Potential: The National Science Board
• Industry Spotlight: Avaya
• University Update
• Break
• Curriculum Overview
• Roundtable Discussion
• IAB Elections
• Lunch
• Next Steps and Closing Thoughts
ECE Department Update

• Randy Bartels earns top honors
  – Sloan Research Fellowship
  – 2005 Beckman Young Investigator Award
  – 2005 Office of Naval Research Young Investigator Program Award

• Louis Scharf receives prestigious Signal Processing Society Award

• Professor Gary Robinson retires after more than 20 years of service

• ECE hosted first-ever IS&T Colloquium

• Final candidates named for Engineering Dean Search:
  – Dr. Lex Akers, James C. Dowell Prof. and Chair of ECE, University of Missouri-Columbia (April 12-13)
  – Dr. Steve Abt, Prof of CE and COE Interim Dean (April 14-15)
  – Dr. Oliver McGee, Prof. and Chair of CE, Ohio State University (April 19-20)
  – Dr. Tony Ambler, BN Gafford Endowed Prof. and Chair of ECE, University of Texas-Austin (April 28-29)
ECE Department Update (cont’d)

• Current enrollment:
  – Undergraduate: 297
  – Graduate: 150

• Quarterly e-newsletter launched in February

• Spring newsletter released in March

• Upcoming department events:
  – Fall Student Advising Day
  – Graduate Study in ECE
  – Reception to honor Dr. Aram Budak
  – IS&T Day for High School Students and Counselors: October 7, 2005
  – Future Vision 2010: September 9, 2005

• Senior Design projects available for industry clients
Enrollment Trends
Undergrad Degrees Awarded

Undergraduate Degrees Awarded

Number

Calendar Year

1999 2000 2001 2002 2003 2004

BSCpE
BSEE
ECE Retention Rates

Disposition of 93 ECE majors who took EE100 in Fall 1999

- Graduated: 34
- Still at CSU: 5
- Dismissed: 12
- Left CSU: 14

Total Enrollment: 93

Status as of Fall 2004
Graduate Degrees Awarded

Graduate Degrees Awarded

- ME
- MS
- Ph.D.

Calendar Year

Number

1999 2000 2001 2002 2003 2004

0 5 10 15 20 25 30 35 40 45 50
Proposal Activity in Terms of Dollars

Fiscal Year

$ VALUE SUBMITTED

$ VALUE FUNDED

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Research Expenditures

![Graph showing research expenditures from 1993 to 2005, with a significant increase in the last fiscal year.](chart.png)
Fall Action Items

**Action item:** Create opportunities for collaborations with other CSU departments to offer more interdisciplinary projects for students.

**Status:** Unique examples of cross-functional collaborations with other departments:

- RAMBox with CSU Theatre Department
- RAMEYE Mouse with CSU Occupational Therapy Department
- RoboCup Competition with Mechanical Engineering

**Action item:** Consider partnering with a foreign department or company on an upcoming senior design project.

**Status:** Future proposal to the National Science Foundation.
Fall Action Items

**Action item:** Emphasize the importance of internships and work with industry to increase the opportunities available to ECE students.

**Status:** New web page created; mechanism in place for informing students of internship opportunities.

www.engr.colostate.edu/ece/ind_relations/internships.shtml

**Action item:** Consider revising the curriculum to include the option of a minor in business, international studies, or a related field.

**Status:** Flyer created to help students understand their options.
Fall Action Items

**Action item:** Encourage students to create their resumes in HTML format for posting to the ECE web site. This allows employers to search and download student resumes online.

**Status:** One possible solution: CSU’s CareerRAM tool, which can be linked from the ECE web site.

- 22 IAB companies already registered
- 2 IAB contacts registered: Cliff Pacaro and Glenn Albert

**Action item:** Follow up with interested board members regarding their involvement in the department’s graduate recruiting event.

**Status:** Event planned for fall and industry participation is encouraged.
Action item: Tony/Andrea will draft a position statement on behalf of the IAB, asking CSU to waive out-of-state tuition fees for international students employed as research assistants.

Status: No longer necessary due to changes in upper administration; new management understands the impact of this issue.

Action item: Make industry publications available in the student common areas, e.g., EETimes

Status: Department subscribed to EETimes. Open to suggestions regarding other valuable publications.
Global Competitiveness and Outsourcing

Leading factors impacting higher education:

1. Increased homeland security
   - Restrictive visa policies dissuading students from applying to study in the U.S.

2. Increased quality in graduate programs abroad
   - Foreign countries are building up S&E at a faster rate than the U.S. can achieve
     - China graduates more engineers than any other country in the world; the U.S. is fourth in engineering graduate production, also behind India and Japan. (IEEE, Nov. 2004)
   - The U.S. has relied heavily on foreign-born engineers
Global Competitiveness and Outsourcing

The impact on ECE at CSU:

2003 graduate school applicants:
• 706 total applicants – 93% international
• 165 students admitted but did not attend – 81% international
• 37 admitted and attending – 59% international

2004 graduate school applicants:
• 306 total applicants – 91% international
• 87 students admitted but did not attend – 90% international
• 30 admitted and attending – 63% international

2005 graduate school applicants (as of April 11):
• 222 total applicants – 91% international
• 52 students admitted – 90% international
Graduate Degrees to Int’l Students

Percent of Graduate Degrees Awarded to Int’l Students

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Ramifications for ECE in the long-term

The need to educate students for competitive careers in a global economy

- IAB input is key to understanding the ever-changing workplace

Recruit students into our program in the face of negative publicity of outsourcing and the perceived undercutting of the value of an engineering degree in the U.S. due to global competition.

- ECE working to bolster recruitment efforts through increased connections with Colorado high schools (IS&T H.S. Day, PEER, Science Fairs, etc)
- Targeted recruiting under way for out-of-state scholars

Increased emphasis on continuing education - retrain engineers in fields that have suffered excessive outsourcing.

- PEER program offers associate degree and certification programs at FRCC
Realizing America’s Potential: The National Science Board Report

“We as a nation have a long-term challenge to sustain U.S. global advantages in science and technology that rely on the capabilities of our workforce. We must take up this challenge.”
Executive Summary

The future strength of the US S&E workforce is imperiled by two long-term trends:

1. Global competition for S&E talent is intensifying, such that the U.S. may not be able to rely on international S&E labor market to fill unmet needs.

2. The number of native-born S&E graduates entering the workforce is likely to decline unless the nation intervenes to improve success in educating S&E students from all demographic backgrounds.
National-level action is needed to ensure our country’s capacity in S&E in an increasingly competitive and changing global market.
Findings based on national workforce policies in five major areas:

- Undergraduate education in science and engineering
- Advanced education in science and engineering
- Knowledge base on the science and engineering workforce
- Pre-college teaching workforce for math, science, and technology*
- U.S. engagement in the international science and engineering workforce

* = Issue is being addressed at CSU; NSB findings not covered in this presentation
Undergraduate education in science and engineering:

1. The issue is not only the choice of S&E study, but continuation in a course of study.
   - Approximately 25-30% of freshmen intend to major in S&E, but the net movement of students over their undergraduate years is out of S&E and into other majors or out of college.

2. Highest quality S&E degree programs are ones that can provide laboratories and equipment, the quality of faculty that are typically engaged in research, and curricula that are up to date.

3. More institutional resources should be directed at improving the quality of teaching, the nature of introductory classes, the design of facilities to support teaching methods, and more effective academic support.
Key Findings

Advanced education in science and engineering:

1. Future progress and world leadership depend on scientific discoveries and developments.

2. Since assistantships on research grants and teaching assistantships are the predominant mechanisms of support for grad students, research funding to academic institutions and undergraduate teaching requirements directly affect the employee pool for jobs requiring advanced education.

3. Recommendations for graduate education include improving guidance and information for graduate students in their career choices.
Key Findings

Knowledge Base on the Science and Engineering Workforce:

1. There is a need for a fuller understanding of the S&E workforce as part of the national economy.

2. Production and employment of scientists and engineers are not well understood as a system. Adding the international context for S&E to the domestic system multiplies its complexity.

3. The consensus strategy is to attract more talented undergraduates to S&E majors and encourage them to continue on to graduate school.
Pre-college teaching workforce for math, science, and technology

CSU’s K-12 Engineering Education Initiative:

Answering the call to prepare highly qualified teachers in math, science, engineering, and technology to teach in secondary schools

- Partnership between College of Engineering and School of Education
- Undergraduate BS Degree in Engineering Science with a concentration in Engineering Education
- Combines solid engineering preparation with pedagogy training
- Aligns with ASEE and IEEE recommendations
CSU’s K-12 Engineering Education Initiative – The Impact on High School Students:

- Understand why/how people design, engineer, and innovate
- Safely use, manage, and evaluate technological systems and engineering processes
- Integrate technology with engineering science, math, and other subjects
- Communicate technology content and processes
- Understand the historical and future significance of engineered designs and impacts of technological solutions
- Develop an awareness of, appreciation for, and engagement in career paths and opportunities in engineering
- Attract underrepresented minorities and women into science and engineering
Key Findings

U.S. Engagement in International Science and Engineering Workforce:

1. U.S. students must be prepared for involvement in the complex world of international science and engineering.

2. Collaborative activities and international partnerships are an increasingly important means of keeping abreast of new insights and discoveries critical to maintaining U.S. leadership in key fields.

3. The U.S. needs visa and immigration policies that provide a clearly understood and straightforward set of options for foreign S&E students and workers.

• **Update:** In May 2004, 25 leading scientific, engineering, and educational organizations representing nearly 95% of the U.S. research community, sent a statement to Pres. Bush and Congress with 6 suggestions on how to improve the current visa process, e.g., revising visa reciprocity agreements between the US and China to reduce the number of times visiting scholars have to renew their visas. Several recommendations have been adopted, others under review.
Update on Visa Processing

Streamlined Visas Mantis Program Has Lowered Burden on Foreign Science Students & Scholars

- The Government Accountability Office reported in February 2005 that average Visas Mantis processing times have improved.
  - However, further refinements needed

Figure 2: Average Time to Close Mantis Cases by Month

Average time to clear in days

Source: State Department, Bureau of Consular Affairs.
Conclusions

The U.S. is in a long-distance race to retain its global advantage in S&E human resources and sustain our world leadership in science and technology.

- The Federal Government has a primary responsibility to lead the nation in developing and implementing a coordinated, effective response to our long-term needs for science and engineering skills. U.S. global leadership and future national prosperity and security depend on this challenge.
Industry Spotlight

Deborah Goldman
Avaya

Providing a World-Class Education for Today’s Global Society
Curriculum Overview

Tony Maciejewski

Providing a World-Class Education for Today's Global Society
EE Curriculum Overview

- Electrical Engineering: 60 hours, 19 classes
- Math & Science: 39 hours, 10 classes
- University Core: 20 hours, 7 classes
- Misc.: 10 hours, 3 classes

Total – 129 hours
EE Curriculum Overview

- Electrical Engineering
- University Core
- Math & Science
- Miscellaneous

EE Core Requirements:
- Digital Circuit Logic
- Microprocessors
- Circuit Theory
- Electronics
- Electromagnetics
- Linear Systems Analysis
- Communications (Stats)
- Semiconductors

EE Electives
Senior Design
EE Curriculum Overview

- Electrical Engineering
- Math & Science
- University Core
- Misc.
- Math
- Physics
- Chemistry
- Sci/Eng Electives
Roundtable Discussion

Questions for IAB

1. As a department that is focused on cutting-edge research and innovation, how can ECE further integrate into its program the project management and design for reliability and cost skills that employers are seeking?

   a) What courses or curricula changes would give students the necessary experience for product development?

   b) Are there tools or processes that would be useful to students, e.g., Six Sigma?

2. Are there other curricula changes that would help the department produce the best engineers who are competitive upon graduation and poised for future success as technology leaders?
IAB Elections
Tim Ash
IAB Vice President

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Next Steps & Closing Thoughts

Tony Maciejewski

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