50 years of innovation ... Looking Backward

Looking Forward.
This transformation, along with the widespread availability of technology in our lives, has naturally created a change in the mindset, and they now want to understand how their training will pre-

This level of maturity and awareness among our students requires that we adapt our methods as well as our message. In response, we are changing our classroom methods and pedagogical approaches in many of our established courses, exploring courses in emerging subdisciplines, and offering study abroad and international internship opportunities to help our students expand their global awareness. We are focusing on new research avenues and continuing to expand the quantity and enhance the quality of our research activities, efforts that enable us to involve an increasing number of undergraduate students in research and other mentored learning activities.

I also want to mention to our alumni how eager we are to remain connected to you. In the coming months, you will receive information about opportunities for you to enhance your education and tools to allow you to network with fellow graduates. We hope that you will benefit from these new resources, choose to stay connected with the department, and, when appropriate, find ways to give back to the department and university.

Sincerely,

Michael A. Jensen
Department Chair

Outstanding Alumnus Award for 2009

Joseph Barrus (BSEE 1987) has been a successful software/hardware engineer and entrepreneur. After graduating from BYU, Joe joined Apple Computer Inc. in Cupertino, California. While there he earned a master’s degree in electrical engineering at Santa Clara University. At Apple, Joe worked as a software/hardware engineer in several groups, including the Newton handheld group.

Leasing Apple in 1992, Joe co-founded AlphaSmart Inc. with Katan Kothari (BSEE 1978) and Mansish Khatri (BSEE 1987). At AlphaSmart, Joe led the technical team that developed the AlphaSmart portable word processor for the K-12 education market. AlphaSmart pushed the envelope in terms of low power, ruggedness, reliability, and ease of use. Over the next 12 years AlphaSmart, Inc. shipped over 1.3 million “smart” devices to schoolchildren all over the world. Joe served as chief technical officer and as a member of the executive management team during AlphaSmart’s IPO (NASDAQ: ALSM) in February 2004 and the subsequent acquisition of AlphaSmart by Renaissance Learning Inc. in June 2005. Joe holds two patents. After transitioning the AlphaSmart product to Renaissance Learning, Joe has been involved in several start-ups and has filed for five additional patents.

Sincerely,

Michael A. Jensen
Department Chair

David Sleed Jr. (BSEE 1998, MBA 2002) arrived at BYU after attending Ricks College in Idaho. While at BYU he studied digital communications, analog circuit design, and wireless circuits design. This prepared him to work as a radio frequency (RF) engineer at World Wireless Communications and later at Vantage Controls. He then co-founded MaxStream Inc. and became its vice president of engineering, responsible for hardware design and manufacturing.

MaxStream was an OEM wireless modem company. Over the years MaxStream’s wireless modems provided wireless links for hundreds of applications, including electric signs, electric meters, data loggers, and even BYU’s robot soccer lab. At MaxStream it was important to design transceivers that were both low cost and high performance. This low-cost effort enabled many wireless applications that were previously served only by the cost of the radio.

While at MaxStream David helped design a 900 MHz 1 watt wireless modem, as well as a 2.4 GHz 100 milliwatt wireless modem. He also filed several patents. Some of the highlights of his design experience were developing high power RF amplifiers and working with others to develop very sensitive receivers. In August 2006 Digi International acquired MaxStream, and in the same year David and his partners were named Ernst and Young Entrepreneurs of the Year.

Sincerely,

Michael A. Jensen
Department Chair
What do the “Father of Stereophonic Sound,” disadvantageous male-to-female student ratios, and DeVeryl Humphreys have in common? The answer is a remarkable story about the improbable rise of a department that makes even the bluest of BYU believers marvel.

The story begins in 1951 when BYU was a far different place than it is today. The modest student body was almost exclusively from the state of Utah, and the university’s fledgling academic programs were housed in a small cluster of buildings while struggling to offer degrees on shoestring budgets. The university’s prophetic destiny seemed impossibly distant. This was the BYU that greeted Ernest L. Wilkinson when he returned to Utah to become president of BYU.

During his first year President Wilkinson noticed the trend of second-year science students transferring to engineering programs at the two state-sponsored universities that competed directly with the engineering faculty recognized that an increased emphasis on graduate education and research was required to maintain a competitive program. In an extraordinary demonstration of self-sacrifice, the senior faculty members volunteered to take on disproportionately large teaching and administrative assignments so that newly hired faculty members could begin to build research programs. This was final step in creating the program we have today.

The history of the Department of Electrical and Computer Engineering is one of enormous returns on the sacrifices offered by hard-working pioneers. The early graduates of the BES program demonstrated their skills and leadership and rose to prominence. The reputation of the program has increased to the point that faculty no longer organize bus trips to carry students to interviews. Today, companies from across the United States now come to recruit and interview students in state-of-the-art facilities in the Counseling and Career Center housed in the Ernest L. Wilkinson Student Center.

Each year for the past 10 years, 110 to 150 students receive bachelor’s degree, 20 to 30 students receive master’s degree, and 5 to 10 students receive PhDs. (See Figure FOO.) In another remarkable transformation, the department transitioned to a bona-fide doctoral-granting program with several highly regarded research groups. The per-faculty level of external funding and published work exceeds that of many top-50 electrical engineering programs in the United States.

As we peer back into the past, we realize we are standing on the shoulders of giants—those who dared to be first: the “Father of Stereophonic Sound,” who dared to be our first dean, and DeVeryl Humphreys, who dared to be our first graduate.
Professor examines proteins as keys to predicting medical conditions, prescribing better treatments

Imagine a doctor taking a small sample of your blood and being able to quickly and accurately determine that you are in the earliest stages of the onset of a disease. Imagine that doctor also being able to identify the therapy that would best work for your body based on how proteins and drugs interact with the proteins present in your body.

It’s a long way away, but researchers like Dr. Brian Mazzeo are contributing to the body of knowledge that could make this scenario possible. Dr. Mazzeo, a Florida native, joined BYU’s Department of Electrical and Chemical Engineering in fall 2008. He earned his BS at MIT and after graduation was awarded a prestigious Marshall Scholarship to study at Cambridge University, where he earned his doctorate. It was at Cambridge that his studies turned to an interdisciplinary study of biological proteins in solutions.

Dr. Mazzeo continues that line of research at BYU, directing the Electromagnetic Liquid Measurements and Interaction Lab. His research focuses on the modeling of electrical properties of liquids and the measurement of liquids using electrical techniques, and he draws on expertise in electrical and mechanical engineering, chemistry, biology, and physics. Proteins have electrical charges associated with their atomic arrangement, and the arrangement of these charges affects their structure, function, and interactions between proteins and their environment. Protein recognition and interaction are the basis of the human immune response. When protein interactions change and abnormal aggregation occurs, the result is disease. Advanced techniques and drugs utilize understanding of these interactions and their measurement.

A major goal of Dr. Mazzeo’s research is to understand these electrical mechanisms that govern protein-to-protein interactions. Accurate measurement of these native electrical properties requires advanced electrical equipment and techniques. The innovative techniques developed in his group to measure these mechanisms will provide biophysicists with precise measurements of electrical responses and will help the industry to create electrical measurement tools for chemical processes.

The group is currently working on a variety of projects related to electrical modeling of liquids and their measurement. Using known atomic arrangements of important proteins, students are simulating the electrical properties of proteins in a variety of solution conditions. Other students are building improved apparatus for stable, accurate, and precise electrical measurements, which will enable further study of electrical properties of protein interactions. New measurement techniques using capillary tubes and non-contact methods are being explored as improved measurement tools.

These measurement experiments lead to greater understanding of protein interactions in isolation. Future research will use similar techniques to explore protein interactions in more complicated environments. Predicting the electrical interactions of these biomolecules will allow scientists to tailor drugs to affect these interactions and to create diagnostic tests that sensitively and selectively measure protein abnormalities.

Professor and students pioneer new techniques in medical imaging

The last several decades have seen enormous advances in medical imaging, eliminating painful and invasive diagnostic surgical procedures and greatly advancing our understanding of the human body and disease. The simple two-dimensional X-rays that dominated imaging for nearly a century are now complemented by a host of more sophisticated technologies: 3D X-ray computed tomography (CT), ultrasound, magnetic resonance imaging (MRI), and positron emission tomography (PET).

MRI in particular has become one of the most important research tools in a broad array of scientific endeavors. The first MRI scanners in the early 1980s gave scientists and clinicians the ability to generate detailed, high-resolution images of the body, leading not only to better diagnostic tools but also to new surgical techniques. Today, MRI provides the best method for visualizing internal structures, and new MRI techniques can image the beating heart in exquisite detail and are enabling new developments in biomedicine.

Behind each of these new applications are imaging physicists and engineers. Dr. Neal Bangerter is one such engineer; his research group at BYU is pushing the limits of magnetic resonance imaging while helping to train the next generation of imaging scientists. This fall Dr. Bangerter is piloting a biomedical imaging course targeted at engineers—the first to be offered at BYU.

Dr. Bangerter joined BYU’s Electrical and Computer Engineering Department in the fall of 2008. A native of the San Francisco Bay area, he holds an undergraduate degree in Physics from UC Berkeley and master’s and PhD degrees in electrical engineering from Stanford University. As a graduate student, he explored new ways of generating useful image contrast with MRI and how to acquire images so as to minimize image artifacts (or errors in the image). Following graduate school Dr. Bangerter worked for several years in industry before returning to Stanford’s Radiological Sciences Laboratory as a staff researcher.

Several students are developing a new MRI technique to improve the diagnosis and treatment of breast cancer.

While rooted in the electrical engineering subdiscipline of signal processing, MRI research draws heavily on concepts in electricity and magnetism and quantum mechanics. A familiarity with anatomy, physiology, and the biological system to be imaged is also helpful. Dr. Bangerter’s research gives students the opportunity to apply their electrical engineering education to problems at the intersection of multiple disciplines. The group collaborates closely with researchers in the radiology department at the University of Utah and in Stanford’s electrical engineering and radiology departments.

Research activities are focused on real clinical problems in which improvements in imaging technology could have a large impact. Several students are developing a new MRI technique to improve MRI’s ability to detect early deterioration in cartilage that heralds the onset of osteoarthritis. One challenge Dr. Bangerter faces at BYU is the lack of an MRI facility on campus; data gathering and testing is done at the University of Utah. Since arriving on campus, he has been working to identify and bring together BYU professors whose research relies on or could benefit from MRI. As a result, more than a dozen faculty members are now working to establish an MRI facility at BYU. The group includes psychologists, chemists, neuroscientists, developmental biologists, and even economists.

“We have the interest and talent across BYU to conduct world-class research in MRI,” says Dr. Bangerter. “I’m excited to be involved in building our teaching and research capabilities in this important area.”

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**Professor examines proteins as keys to predicting medical conditions, prescribing better treatments**

A major goal of Dr. Mazzeo’s research is to understand the electrical mechanisms that govern protein-to-protein interactions.

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**Professor and students pioneer new techniques in medical imaging**

The last several decades have seen enormous advances in medical imaging, eliminating painful and invasive diagnostic surgical procedures and greatly advancing our understanding of the human body and disease. The simple two-dimensional X-rays that dominated imaging for nearly a century are now complemented by a host of more sophisticated technologies: 3D X-ray computed tomography (CT), ultrasound, magnetic resonance imaging (MRI), and positron emission tomography (PET). MRI in particular has become one of the most important research tools in a broad array of scientific endeavors. The first MRI scanners in the early 1980s gave scientists and clinicians...
We want to express our gratitude to our generous alumni who donate to support our students. Over the years we have received gifts ranging from $10 to more than $1,000,000. These funds are used to enhance the educational experience of both undergraduate and graduate students.

The interest earned from scholarship endowments is used to provide scholarships and tuition credits to undergraduate and graduate students in perpetuity. Scholarships are usually awarded competitively or according to criteria established by the donor. A tuition scholarship for one undergraduate student requires approximately $80,000. Funding a graduate fellowship in perpetuity requires approximately $500,000.

An endowed chair enables the department to hire an additional faculty member who is usually an individual with considerable experience and expertise. Endowed chairs significantly raise the external visibility and stature of BYU and the department and can bless the lives of students for generations to come. A fully funded endowed chair requires approximately $5 million.

The department currently has scholarship endowments totaling $1,400,000, one endowed chair, and one professorship. Individuals or companies interested in donating to these funds or establishing an endowment should contact the department chair.

We encourage you to visit our department webpage at ece.byu.edu and you will find an Alumni & Friends tab. From there you can access the university’s alumni database to find old friends. We also have a link to the BYU EEEn LinkedIn group. We encourage you to join and use this resource to make new contacts and post messages and job openings.

Make a difference!
Endowing a chair, professorship, or scholarship will make a lasting impact on the department.

Alumni Connections
Homecoming Banquet
Please join us for our annual ECEn homecoming banquet on October 8th. We will gather to mingle and become reaquainted at 6:00 p.m. in the Wilkinson Student Center, Room 3211. In addition to dinner, the current department chair, Dr. Mike Jensen, will highlight recent progress in the department. He will be followed by a speaker who will address us on broader challenges facing engineers and the world in general. As the event date nears, the alumni advisory committee will be in touch with alumni we have contact information for. You can also visit ece.aa.byu.edu to register for and learn more about the event.

Online Links
Our department webpage now has many links specifically for our alumni. Visit ece.byu.edu and you will find an Alumni & Friends tab. From there you can access the university’s alumni database to find old friends. We also have a link to the BYU EEEn LinkedIn group. We encourage you to join and use this resource to make new contacts and post messages and job openings.