IOWA ENGINEER

The sky's the limit
Message  FROM THE DEAN

I am honored to be able to serve as the new Dean of the College of Engineering at The University of Iowa. Although I have been here only since the end of December, it is clear that the high quality of the students, faculty, staff, and alumni makes this an exceptional institution.

First, I am very pleased with the high quality of students in the College. We attract students who want to be engineers—and something more. Highlighted in this issue are four engineering students who "take the program out of the box" by complementing their education with additional studies or involvement in outside activities (pages 8-11). We are proud that the College is third in the U.S. in producing Tau Beta Pi national engineering honor society graduate scholarship winners since 1980. No other public U.S. university has produced more. Also, The University of Iowa American Institute of Chemical Engineers student chapter received the national Outstanding Student Chapter Award for the 1998-1999 academic year. This is the seventh year in a row that a University of Iowa group has won the award.

I am impressed with research contributions made by the faculty in the College. For example, in this issue you will read about Greg Carmichael, Professor of Chemical and Biochemical Engineering, and Codirector of The University of Iowa Center for Global and Regional Environmental Research, and his research of the causes, processes, and consequences of air pollution (pages 4-7). Our Center for Computer-Aided Design keeps the College in the forefront of designing mechanical systems without the need for expensive prototypes. The new National Advanced Driving Simulator is unique in that it uses the world's most sophisticated simulation, providing an opportunity to study human factors and design safer highways (page 18). The Iowa Institute of Hydraulics Research is a renowned leader in fluid mechanics, hydraulics, cold-regions engineering, and water resources, and has been known internationally for more than 70 years for the contributions of its faculty, staff, and students. Equally important, the College may be the only engineering college in the U.S. where all departments have ongoing research projects with one or more of the five health sciences colleges on one campus.

As the Dean of Engineering, I have been entrusted with setting ambitious, yet realistic, goals that can make this College become even better than it is. We have a solid foundation, but will need the encouragement, support, and commitment of alumni and friends of the College if we are to be successful. A few of the areas where we are moving forward include:

**Curriculum Reform**

Much has been accomplished in adapting our engineering curriculum to give engineering students an education beyond technology. Faculty teams are currently working hard to finalize core curriculum objectives that will shape new approaches to learning. We will report our progress in greater depth in a future issue of Iowa Engineer.

**Strategic Planning**

Coupled with curriculum reform is the intent to develop a strategic plan that guides the College towards a vision for success: to be the best engineering college of its size in the U.S. We already have engaged our departmental executive officers, centers and institutes directors, and the Engineering Advisory Board to help formulate a solid strategic plan.

**Ambitious Student Recruiting**

At both the undergraduate and graduate levels, this College will be aggressive in achieving higher enrollment levels, while maintaining the high quality of students for which we have built a solid reputation. Our presence in high schools, junior colleges, and other universities will increase significantly. This is an exceptional place to study engineering as so many of our alumni can attest. We now have an opportunity to marshal our recruiting resources so that we grow in numbers as much as we have grown in academic quality.

**Completion of the New Seamans Center for the Engineering Arts and Sciences**

Construction of the new addition to the Seamans Center for the Engineering Arts and Sciences is nearing completion. We will be moving into classrooms, team-study rooms, and laboratories in our new wing during the summer. Following this, we will begin a major renovation of our older facilities. In a little more than a year, our new academic home will be finished. It will become a place where alumni will be eager to visit and meet with classmates and friends; a center for collaboration with colleagues from other UI colleges; and a resource for corporate partners who assist in educating, recruiting, and hiring talented UI students.

During the next year, I plan to visit many cities to meet with alumni, corporate partners, government decision-makers, and potential students and faculty. I hope to meet many of you personally. Meanwhile your ideas, suggestions, and comments are always welcome.

On behalf of the College, I hope you have a rewarding and prosperous start to the new century. We are eager to build upon the continued support that you and other generous alumni and friends have given us.

Sincerely,

Anthony Hines
Dean
Out of the box
These four undergraduate students, including Helen Fuller, below, create unique academic and personal routes to becoming an engineer ... and something more.

Of walnuts and water
Joe Summers (BS 1948 in civil engineering), a renowned irrigation engineer, also crafts international water rights agreements and a 210-acre walnut grove.

The sky's the limit
Professor Greg Carmichael collects data from China to model the nature and behavior of air pollutants and airborne dust.

The laws of fusion
Two graduates of the UI College of Engineering, Tom Buckman (BS 1961 in mechanical engineering) and Greg Kirsch (BS 1987 in electrical engineering), each transformed his technical expertise into a career in intellectual property law.

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"When Summers Engineering began, we had two people: me and my wife, Rose. I was the engineer and she was the secretary. It's good to have a secretary who can talk back—especially one who's usually right."

Of walnuts and water

It's a long way from the tall grass prairie of Ardon, Iowa to the arid hills of Hanford, Calif., but through a lifetime of engineering and agricultural achievement, Joseph B. Summers (BS, 1948, in civil engineering) has bridged the distance. In the process, he has made a profound impact on water conservation and preservation in the water-starved West. And for almost 40 years, Summers Engineering has provided consultation services to major irrigation and drainage projects around the world.

Drawing on his Iowa farm childhood, Summers also developed a 210-acre walnut farm near Hanford. Summers' model farm soon became renowned for its cleverly engineered groundwater use and reuse, making him a leader in California's walnut agribusiness.

"My father was a railroad man," says Summers, who has traveled on some of the world's most famous trains, including the Orient Express. "But we also owned 160 acres near Ardon. My two brothers and I did all the farming."

Summers says that as a boy, he became interested in engineering by watching the trains rumble past the depot where his father served as a railroad agent. After graduating from high school in 1941, he began his engineering studies at Iowa. But war intervened, and Summers enlisted. He served one year in Europe as a B-24 and B-57 bombardier over Germany and Austria.

"After the war, I was anxious to return to college," Summers says. "I came back to a school that had some terrific teachers."

Summers cites hydraulic engineering professors Hunter Rouse and Joseph Howe, civil engineering professor Ned Ashton, and engineering dean Frances Dawson as "fine men and wonderful mentors."

He adds, "Tom Farrell was my instructor in technical writing. He provided great benefit to engineering students in this important aspect of their training."

Summers used his Iowa education in hydrology, hydraulics, steel and concrete design, and technical writing as a springboard from which to launch a highly successful career. He landed a "great opportunity" in Denver, Colo., working full-time as a hydraulic engineer for the United States Bureau of Reclamation. At the same time, he attended night school at the University of Colorado, where he earned a master's degree in civil engineering in 1951.

After a stint with Chicago's Harza Engineering Company, Summers landed a job as an assistant irrigation engineer for the Modesto Irrigation District, one of California's largest water agencies.

"This is where I wanted to be," he says of his move to the state where post-World War II growth became entangled with water resource and quality problems.

For three years, Summers learned firsthand about the engineering, political, and social challenges created when rapid growth and expanding agricultural development demand more and more water. He then moved to Stoddard and Karrer Consulting Engineers, a small private firm where he served as the principal engineer for several major irrigation projects.

In 1962 Summers launched his own firm after three California irrigation districts and government agencies asked him to increase the productivity of 200,000 acres of arable land.
"When Summers Engineering began," he recalls, "we had two people: me and my wife, Rose. I was the engineer and she was the secretary. It's good to have a secretary who can talk back—especially one who's usually right.

But Summers' reputation as an irrigation and drainage expert attracted so much business that the firm quickly grew. Today Summers Engineering employs six engineers and has created a legacy of high-profile, high-quality projects for urban water supply agencies and irrigation districts.

Generations ago, western American farmers and ranchers began organizing irrigation districts to help allot, control, and preserve water rights. Today some of those districts contain ranch, suburban, and urban land. In an arid climate, irrigation districts must protect their water and continue to look for additional supplies. These efforts affect millions of people in this country and Mexico.

With his expertise in the conservation and application of water, Summers was a natural choice to become an irrigation district planner and negotiator. In 1972 he served as a United Nations consultant on irrigation and drainage in the Pampas region of Argentina. He also has assisted on several Brazilian irrigation projects.

In 1986 the U.S. Committee on Irrigation and Drainage named Summers national chair of a series of four regional meetings on toxic substances in agricultural water supply and drainage. Four years later, he took on leadership of one of the largest, most complex water conservation negotiations in U.S. history.

As chair of an oversight committee for the massive water conservation program, Summers helped craft an agreement between giant Metropolitan Water District of Southern California, which supplies water to the metropolitan Los Angeles area, and the largely agricultural Imperial Irrigation District at the southern tip of the state. The project required eight years of design and construction. Using a projected budget of $100 million, the participants established a goal of providing the Metropolitan District with enough water every year to cover 106,000 acres one foot deep.

"We came in under budget by $700,000," Summers says, "and exceeded our water goal by 2,000 acre-feet per year. And we did it while keeping water politics out of the agreement."

Although the landmark agreement was even more of a success than anticipated, the two agencies continue to be involved in contentious new water battles. Litigation for water may never end, Summers notes, in a region where the resource is so precious and negotiation for water rights involves the federal governments of two countries, several Indian tribes, and a half-dozen states as well as dozens of water districts and cities, and millions of individuals.

"As tough as some recent negotiations have been," he says, "the real challenge will come in 50 years, when there will be even more people, more agriculture, more industry, and less water."

Summers brings home his concern for water conservation. Since 1963, when he and his wife bought 20 acres of farmland in Kings County, this self-proclaimed "Iowa farm boy" has trained his expert eye on his own water use. Summers employs grain crops as ground cover to help retain soil moisture. Although his operation—which now consists of 210 acres of walnuts and 20 acres of pecans—relies on the vast southern San Joaquin Valley groundwater basin, Summers employs flood irrigation on level basins, a water-conserving strategy in arid lands. In addition, he has installed a network of pipelines that allows him to take advantage of excess surface water during especially rainy periods.

"Some people tell me I farm more expensively because I'm an engineer," he says with a laugh. "But this arrangement has allowed me to recover 15 feet of groundwater in the last few years."

With the increasing success of his walnut farm, Summers joined Diamond of California, a growers' cooperative formed in 1912. He served on the coop's board of directors for 12 years, and Diamond's trade magazine recently featured him in a grower profile titled "Water Master."

Summer's impact has extended far beyond his engineering firm and his farm. In 1981 Summers was the U.S. representative on a panel of water experts at the Eleventh Congress of the International Commission on Irrigation and Drainage, held in Grenoble, France. In April 1999 he received the inaugural Merriam Improved Irrigation Award from the U.S. Committee on Irrigation and Drainage. Summers was recognized for some 35 years of work with the committee, including six years on its board of directors, and for endowing its USCID/Summers scholarship award.

Nor has the Iowa native forgotten his roots. Summers serves on the College of Engineering Advisory Board, and he and his late wife donated $350,000 to build a classroom in the new Seams Center for the Engineering Arts and Sciences. The interactive electronic classroom seats 72 students, each at a desk with a computer terminal.

Summers also supports an undergraduate scholarship in civil and environmental engineering. When the advisory board meets in the spring and fall, Summers returns to Iowa City a day early so he can talk with the scholarship recipient. During one visit, he also presented a seminar to students and faculty.

Of his years at Iowa, Summers recalls "professors who were the kind of people who entered my life and made a difference. My experience at Iowa gave me the foundation to pursue a greatly satisfying career."
Greg Carmichael has become a leader in his field and a familiar name in laboratories, classrooms, and boardrooms around the world. He is one of a select few researchers invited to help the United Nations’ World Meteorological Organization develop a strategic plan to tackle global climate change. As Carmichael begins to prepare for the first World Meteorological Organization planning workshop, he looks ahead to work yet to be done around the world and at home.

The sky’s the limit

As a professor of chemical engineering and codirector of The University of Iowa’s Center for Global and Regional Environmental Research, Greg Carmichael is an expert in the causes, processes, and consequences of air pollution. In the course of his 21 years of research at Iowa, Carmichael also has navigated the labyrinth of international politics and complex policies created by governments to harness global pollution. On the wall of his Iowa City office hangs a piece of equipment critical to the success of his research: a three-dollar Swedish Frisbee®-like toy.

Forty-five such toys—labeled with the Swedish brand name “Hej Feter”—serve as rain guards to protect atmospheric sampling devices set up by Carmichael in 14 countries throughout Asia. The sampling devices, about the size of an American quarter, consist of filters that capture data about the chemical composition of China’s atmosphere. Every month Carmichael’s Chinese colleagues collect the data and forward them to Iowa City, where they augment the growing body of information Carmichael uses to model the nature and behavior of air pollutants and airborne dust.

“Dust is just one type of airborne particle, or aerosol,” says Carmichael. “We’ve studied gaseous pollutants like sulfur dioxide for some time. But the models I’m most interested in examine the interactions between gaseous pollutants and aerosols.”

Carmichael says the working definition of a pollutant is “a trace species with an adverse impact on the environment.” During the last two decades, researchers have devoted considerable attention to the causes of increased greenhouse gases and air pollutants and their long-term environmental and health risks. In developing countries such as the former Czechoslovakia, for instance, sulfur dioxide emissions from coal-fired power plants and unique weather patterns have proven to be a volatile combination resulting in severe air pollution that plagues tens of thousands of people.

Other research has implicated greenhouse gases such as carbon dioxide in global warming. Perhaps the most notorious greenhouse gases are chlorofluorocarbons (CFCs), synthetic molecules whose mid-century production enabled industrialized nations to refine the refrigeration process.

“CFCs certainly improved our quality of life in the short run,” Carmichael says. “They were nontoxic, nonflammable, and—we thought—inert. Then we started finding some unexpected chemistry taking place in the upper atmosphere.”

That chemistry caused a hole to form in the ozone layer, the atmospheric shield that protects the earth from the sun’s ultraviolet rays.

But, Carmichael notes, gaseous pollutants aren’t the only environmental culprits. Certain activities—including the burning of fossil fuels—release aerosols as well as noxious gases into the air. Like polluting gases, Carmichael theorizes, these airborne particles have a profound impact on the nature of our global atmosphere.

The winner of the College of Engineering’s 1999 Faculty Research Award says most people recognize the health threat of breathing air that contains small particles, be they from windblown dust or belching industrial chimneys. But Carmichael’s research has carried the theory and analysis of aerosols in new directions. The Iowa researcher is exploring the effects of particulate matter on global weather patterns. In addition, he is urging scientists and policy makers to consider the human consequences of pollution on a global scale.

“If we are going to develop plausible models of climate change,” he says, “it’s essential to understand the role of particulates in the atmosphere. We know that global warming is a probable outcome of the increase in greenhouse gases. But the
burning of fossil fuels also produces considerable amounts of aerosols, which actually have a cooling effect on the atmosphere. "We must begin including atmospheric particulates in our models before we develop and exercise environmental policies," he concludes.

The depletion of the earth's protective ozone layer has meant greater exposure to ultraviolet (UV) radiation. In years to come, increase in UV radiation may result in higher rates of skin cancer and cataract development. In addition, even subtle climate change can result in profound shifts in agricultural patterns.

While production and use of CFCs have caused ozone depletion in the stratosphere, miles above the earth, other human behavior has released millions of tons of particulates into the atmosphere most closely embracing the planet. Ironically, Carmichael says, pollution in the troposphere becomes a cooling shield against UV radiation. Thus, as urban areas and industrialized regions start burning cleaner fuels and using fuel more efficiently in a quest for cleaner air and better immediate health conditions, they also may increase their exposure to UV radiation.

"We've seen this effect in China," Carmichael says. "Our early model linking ozone depletion and climate change didn't
seem to fit our observations. Temperature just doesn’t seem to be increasing as quickly as we expected. That’s when we began to examine the cooling effect of aerosols.

As a chemical engineer, Carmichael pushed his models even farther to examine the very nature of the particles being spewed into the atmosphere.

“With increased attention on aerosols,” he says, “we knew something about the sources of the particulates and their effect on human health. But it turned out that we didn’t know much about the chemical reactions of the particulates themselves.”

Carmichael became particularly interested in the nature and effects of the surface area around atmospheric particles. With so much particulate matter being released into the air, total surface area of the particulates is staggering. And both the physical and chemical nature of the molecules’ surface area play a significant role in atmospheric conditions.

“Not only is this new area of atmospheric and chemical science fascinating,” Carmichael says, “it’s also proving to be an important source for understanding and controlling our environment.”

He adds that the multifaceted mix of climate, health, and human behavior is best examined in terms of two scales: the impact of environmental degradation, and the development of solutions for it.

“We used to look at pollution only in terms of its local effects,” he says. “As a result, we created local solutions that not only didn’t solve regional or global environmental problems but actually exacerbated them.”

As an example, Carmichael cites the environmentalists’ mantra of 20 years ago, “The solution to pollution is dilution.” During the 1950s and 1960s, the major issue was local pollution from factories. Technologists and policy makers decided that building smokestacks 300 meters tall would dilute the impact of pollution by allowing emissions to blow downwind across a wider area.

When lakes in Norway began “dying,” researchers pinpointed the culprit: pollution generated hundreds of miles west, in England. Carmichael says we now know that higher smokestacks simply distribute pollution over longer distances. It’s a cautionary tale that underscores the importance of examining pollution’s global impact and considering the global effect of remedies.

Carmichael and associate professor of chemistry Vicki Grassian are in the midst of a three-year study of the interactions between aerosols and the ozone layer. The research is being funded by a three-year, $473,000 grant from the Department of Energy’s Atmospheric Chemistry Program. Carmichael and Grassian will combine laboratory studies and computer modeling to assess how chemical reactions involving aerosols affect atmospheric chemistry.

In 1997 the two researchers also were awarded one of only six $90,000 grants for postdoctoral research given nationally by the Camille and Henry Dreyfus Foundation. The Dreyfus grant supports postdoctoral
that studying Japanese or international relations could be just as important for their engineering courses. These disciplines help us understand and enhance the multidisciplinary nature of science and engineering research today.”

significant to the numbers.”

To develop his global environmental change models, Carmichael uses data gathered by his colleagues in China. As one of the most rapidly developing regions of the world, Asia burns massive amounts of coal. The resulting release of gaseous and particle pollutants has the potential to affect air quality and atmospheric conditions around the world. Gathering data across a wide swath of Asia and wielding Grassian’s computer models, Carmichael has demonstrated that pollutants released in China affect not only urban environments in Asia but—thanks to the westerly flow of the wind and jet stream—also in the United States.

For his efforts, Carmichael was awarded the first Recognition Award from the Sixth International Conference on Atmospheric Sciences and Applications to Air Quality. The biennial conference was held in Beijing, where Carmichael was recognized for his “continuous and exceptional contributions to the application of scientific knowledge for the goal of improving air quality worldwide.”

In his work at the UI Center for Global and Regional Environmental Research, Carmichael fosters interdisciplinary research and training in environmental studies. Throughout his academic career, he has encouraged his students and research teams to examine the human as well as the scientific dimension of global environmental change.

Years of work in Asia have underscored for the Iowa researcher the need to take into account the cultural, political, with global environmental issues will take decades. In the meantime, Americans use 25 percent of the energy consumed worldwide. And we have lobbyists successfully getting sport-utility vehicles exempted from air quality standards. These vehicles are huge emitters of pollutants.”

Through his research and tireless dedication, Carmichael has become a leader in his field and a familiar name in laboratories, classrooms, and boardrooms around the world. He is one of a select few researchers invited to help the United Nations’ World Meteorological Organization develop a strategic plan to tackle global change. Federal, state, and industry support for his research exceeds $4 million, with awards from NASA and the U.S. Department of Energy. He also serves as a consultant for several industries and agencies in the United States as well as for organizations in Canada, Japan, and Europe.

“We talk a lot about the internation-alization of our lives,” Carmichael says. “Even the University is making this issue part of its strategic plan. I tell my engineering students that studying Japanese or international relations could be just as important for their careers as their engineering courses. These disciplines help us understand and enhance the multidisciplinary nature of science and engineering research today.”

And although Carmichael doesn’t know Swedish, he certainly does understand the meaning of the Scandinavian toy on his wall.
To understand what makes Michael Bauerly tick, all you have to do is look at the names of the colleges where he applied. "I've always been interested in art and architecture," the sophomore industrial engineering student says, "so it made sense to apply to Reed College and the University of Chicago, which don't even have engineering programs. I had pretty broad interests then and still do. When I was looking for colleges, I knew I had to go somewhere that wouldn't limit me to studying just engineering."

Bauerly says Iowa fit the bill perfectly without breaking the bank. "I didn't want to graduate with a lot of loans to pay back," says the Presidential Scholar, who also was awarded a college scholarship. "Plus, I really liked it here. My folks both graduated from Iowa, and when mechanical engineering professor Barry Butler took me through his lab, I knew this was it."

Bauerly adds that once he enrolled, he "was pleased to discover the faculty members were wonderful. It's been a great experience."

The Council Bluffs native says his work last summer on robotics in the college's GROK lab (see page 16) convinced him to focus on industrial engineering. Because industrial engineering requires expertise in psychology, Bauerly also has been able to explore his longstanding interest in the brain, behavior, and memory.

But choosing engineering did not mean Bauerly had to abandon his passion for art. Indeed, he says, for students with wide-ranging interests, one of Iowa's engineering curriculum is its flexibility. "It's great to be able to walk out of physics and head for a drawing class," says Bauerly, who seriously considered pursuing a double major in engineering and fine art. "At the moment, I'm working in charcoal, pastels, and acrylics. I think studying art and engineering at the same time has helped me see things in new ways. I can see structure in art and creativity in engineering. The two disciplines overlap nicely."

Bauerly, who has read Zen and the Art of Motorcycle Maintenance, adds that the combination of engineering and art have helped him "see the world from both a classical and romantic perspective. I understand the importance of underlying form and appreciate the importance of aesthetics."

He adds that during his senior year of high school, he thought he might have second thoughts about Iowa once he enrolled. "I was determined to go someplace farther away from home," Bauerly says, "where I didn't know any other students. And I was worried because I thought I might not be challenged at Iowa. Plus I didn't know if a big state school was for me."

"But now," he says, "I look back on my first two years and can't imagine how things could have turned out any better."
April Rathe — In the flow

When April Rathe began working at an e-commerce start-up company this spring, she was more than capable of talking engineering—in two languages. A college debater with a minor in Spanish, Rathe is adept at arguing her point and understands other cultures. As a newly minted industrial engineer with robotics experience, she will be a superb addition to Inventa, the Washington, D.C., firm that recently snapped her up.

“I decided to work for a smaller company,” Rathe says, “because it will be a great opportunity to work at all different levels. And I’m really interested in working as a consultant for business-to-business web applications for other companies. Inventa is an exciting young company where I’ll be able to do that.”

The Ottumwa native adds, “for a long time in high school I wanted to go to college out East. But in the end, the financial drawbacks weren’t worth it. Once I was at Iowa, I discovered just what a great engineering education I could get here.”

Rathe says she chose Iowa because the engineering college is relatively small, a characteristic that encourages individualized attention. It also has given her the chance to stretch her intellectual boundaries beyond the engineering classroom. During the last three years, for instance, Rathe has helped assistant professor of industrial engineering Geb Thomas perfect various robots in the college’s GROK lab (see page 16). And as a dedicated liberal arts student, she has spent countless hours polishing her fluent Spanish.

“I minored in Spanish,” Rathe says, “because I loved it and it was something different from engineering. I’m fascinated by languages and cultures, and being able to speak a second language gave me a leg up in the job market.”

Rathe says that when she was job hunting, a number of companies mentioned that her fluency in Spanish was a factor in their decision to offer her a position. Rathe’s way with words doesn’t end there. As a longtime debater, she has spent years honing her formidable debate skills.

“The fact that Iowa’s debate program is famous across the country,” Rathe says, “helped influence me to come here. Deb-
Jefri Subieta — In kind

Jefri Subieta chose to earn his degree at The University of Iowa for reasons that reach beyond the engineering college.

"I was pleased with other campuses, including Iowa State," the fifth-year mechanical engineering student says, "but I was looking forward to going somewhere where the atmosphere was more open, the campus is part of town, and you can see all kinds and ages of people right outside the university door."

Subieta grew up in Iowa City, but, he says, he didn't appreciate the importance of the relationship between the community and the University until he started looking at colleges.

"This isn't just a campus," he says. "The University is a central part of life in Iowa City and Iowa City gives lots of support to University students."

That relationship, he adds, encouraged him. He says, "It was rewarding to give back to the community that has been so great to me and my family. It also feels great to help kids from my old high school City High, as well as kids from West High. Being involved helps me see the various backgrounds and situations of Iowa City residents."

"And," Subieta adds, "I've met many MESA members who have become important mentors for me in engineering and leadership."

Subieta says his interest in the world's diversity led him to take courses outside the engineering college.

"I don't come from a family of engineers," he says, "so even though I'm interested in the technical sciences, I'm also interested in a lot of other fields. It's important to fulfill that part of yourself too, and Iowa provided an atmosphere where I could pursue all my intellectual interests."

During his years at Iowa, Subieta has taken courses in history, anthropology, and business.

His studies in the humanities and social sciences—as well as his bilingualism—will serve Subieta well this summer when he takes a position as a special projects engineer for 3M Corporation's Optimized Operations Program.

Every six months or so, he will to tackle a new project in a new part of the country. Subieta says this eclectic experience will help him achieve his ultimate dream of managing engineering projects in Latin America.

Thanks to his broad engineering education at Iowa and involvement in organizations such as MESA, that leap should be shorter than it might have been.
Helen Fuller — In step

First-year biomedical engineering student Helen Fuller says that when she considered her college options, she looked at Northwestern and Washington Universities, as well as Iowa. “And,” she adds, “Harvard also looked nice.”

But Fuller chose Iowa—and for good reasons. The College of Engineering offered her one of the hottest biomedical engineering programs in the country, all wrapped up with a terrific financial-aid bow. It also allowed her to begin as a full-time Iowa student prior to her graduation from West Branch (Iowa) High School.

“The first thing I had to do,” the 17-year-old says, “was decide between finishing my last year of high school or starting at Iowa. One of the deciding factors was the financial support I received.”

The National Academy of Arts, Sciences, and Engineering, the Iowa Summer Institute, and the College offered Fuller financial incentives. In addition, she was named a University of Iowa Presidential Scholar, an honor reserved for only 50 of the University’s most gifted and promising students.

“It’s really great to have the opportunity to go to school virtually free,” Fuller says. “And being a Presidential Scholar has lessened the pressure of having to finish in four years. I can take more than engineering courses, experiment a little, and explore my other interests.”

And those are many. At the moment, Fuller is considering adding a second major in the Liberal Arts or a minor in Spanish or philosophy. She is treasurer of the university Fencing Club, a weekly volunteer at the Iowa City Crisis Center, and a commentator for the Iowa City Press-Citizen. Six hours a week, Fuller works in the biomechanics laboratory, where she worked last summer through Opportunity at Iowa’s Secondary Student Training Program. When lab director and professor of biomedical engineering V.J. Goel saw the quality of her work, he invited her to continue during her first undergraduate year.

As if those activities aren’t enough, Fuller also plays clarinet in The University of Iowa Marching Band, an experience she describes as nothing like her years in high school band.

“For one thing,” she says, “there’s a terrific sense of school spirit in Iowa’s band members. And then there’s Hell Week.”

Hell Week consists of several days of hours-long practices before the season’s first football game. It’s infamous as a grueling, rowdy, and fun “bonding” experience.

Fuller took it all in stride, of course, just as she has accommodated the rest of her first year experience at Iowa.
BY JEAN FLORMAN

“My real interest is in being part of bringing forth a new generation of products. I like to be close to technological development, part of a business, and a help to companies that profit from their innovations.”

Tom Buckman

A shepherd for innovation

Tom Buckman discovered early in his professional career that he enjoyed being around new products and new companies. As recently retired vice president of patents and technology for diversified manufacturing company Illinois Tool Works (ITW), Buckman has had plenty of opportunity to witness technological innovation and corporate development.

The Clinton, Iowa native earned his bachelor’s of science degree in mechanical engineering at Iowa in 1961, then entered officer candidate school. After three years in the U.S. Navy, he joined NASA at the Manned Spacecraft Center in Houston, where he worked until 1967. Those were heady years to be working in the aerospace field, but Buckman decided to head for new career territory.

“I didn’t want to throw away my technical experience,” he says, “but pursue engineering and something more.”

While still working for NASA, Buckman began to study law. After three years, he and his family moved to Washington, D.C., for a job as a patent examiner with the U.S. Commerce Department.

“I worked at the Patent Office by day,” he recalls, “and went to law school at night. My law degree didn’t come quickly, but at the time I didn’t think it was hard because law was a discipline I was committed to learning. But now when I think back on it, I know that I got my degree through a combination of commitment, focus, and a family that was very considerate.”

Buckman earned his J.D. degree from American University in 1969 and immediately landed a position with ITW, where he has remained for the last 30 years.

“I didn’t know it at first,” he says, “but I found that I really enjoy being around new products and new companies. The future of most companies is their ideas and inventions. I got to see those new innovations as they were developed, plus help protect them for the future growth of the company.”

ITW is a diversified developer and manufacturer that prides itself on developing small entrepreneurial businesses that produce everything from nuts and bolts to welding equipment. The company—which sold $10 billion worth of products last year—also is a leader in the packaging industry. One of its innovations is the almost-ubiquitous plastic “ring carrier” that holds together beverage six-packs.

“That packaging innovation was developed by ITW 40 years ago,” Buckman says. “Twenty years ago, we made the carriers photodegradable, and today the company continues to make them pretty much the same way. I guess you can say that idea was a success.”

As head of the company’s in-house patent department, Buckman guided his staff of four patent attorneys in protecting ITW’s technological inventions and advances. They shepherd patent applications through official governmental channels and defend patent rights already granted. In patent law litigation is a “necessary evil,” according to Buckman, yet can often be avoided.

“My real interest has been in being part of bringing forth a new generation of products,” he adds. “I like to be close to technological development, part of a business, and a help to companies that profit from their innovations.”

Because he has enjoyed his fusion of engineering and law, Buckman encourages young engineering students to push beyond their own interests in the technical sciences.

“Engineers have a lot more to offer than just their expertise in design,” he says. “And it’s rewarding to be part of a growing business. Working on patents helps you understand how companies encourage people to create and the kinds of engineering projects that become successful.”
An advocate for the complex

By the time he was 16 years old, Greg Kirsch already had developed computer software programs that could manage commercial real estate and help his high school football coach analyze the competition. Today, Kirsch remains adept at applying analytic insights to practical problems—a skill he uses every day in the practice of patent law.

The Quincy, Ill. native earned his electrical and computer engineering degree from Iowa in 1987.

"As a high school student, I applied to several Big 10 universities," Kirsch says. "Purdue, Wisconsin, Illinois. Then I came to Iowa. I was really impressed. The UI College of Engineering seemed different—smaller, more friendly. Professor [Jon] Kuhl showed me around his lab, and I decided this was the place for me."

Kirsch thrived in the electrical and computer engineering program, but as graduation approached, he decided to be something other than a traditional engineer. His brother, an attorney, encouraged him to consider law school.

"I knew I wanted to use my engineering education, but perhaps in another field," Kirsch explains, "so I decided to give law school a try."

A member of the Georgia, Virginia, and District of Columbia bars, Kirsch also has been accepted to practice patent law before the U.S. Patent and Trademark Office (USPTO). Fifty to seventy percent of applicants fail the difficult patent bar examination. Kirsch—who passed the exam on his first attempt—notes that to represent a client seeking a patent, an attorney not only must have passed the patent bar exam but also have a degree in engineering or an applied science such as chemistry or computer science. In fact, Kirsch says that he often feels that he uses more of his engineering background than many engineers.

"My work covers the gamut of cutting-edge technology," says Kirsch, who heads the software, e-commerce and electronics patent practice of his firm, Needle & Rosenberg, P.C., in Atlanta, Ga. "When dealing with patents on complex technology," Kirsch continues, "it's extremely important to understand the technological development and implications of the innovation you are representing."

It's also vital to convey the scientific significance of that new idea and transform technical language into the language of advocacy. Although patent examiners at the USPTO are themselves well versed in the intricacies of applied science, patent attorneys still must explain the technological particulars of their clients' innovations. In addition, if a patent results in litigation in federal court, patent attorneys must be able to convince a judge or jury, who are likely not technically or scientifically trained, that these technologies deserve patent protection because they are "useful, new, and non-obvious"—the three-pronged legal test of patentability.

Kirsch, a member of the UI College of Engineering Advisory Board, asserts that language skills are critical for any engineer, whether teaching undergraduates in a state university, practicing as an engineer, conducting research in a corporate laboratory, or practicing as a patent attorney.

"Engineers don't just work in a vacuum," he says. "We have to be able to communicate effectively—orally and in writing—to each other, to engineering students, and to non-engineers."

In his own legal practice, Kirsch relies on simple language and the art of the analogy to convince juries and patent judges.

"Even when I have to use figures and calculations, the key is always: Focus on a theme. The most complex inventions can be boiled down to a few basic concepts."

Although Kirsch's professional life takes him around the world, he carves out time at home with his wife, Lanie, and his two young children, Amanda and Aaron (and he even manages to enjoy an occasional tennis match). Twice a year, his role as an engineering college advisory board member brings him to his other home in Iowa City.

"Engineers don't just work in a vacuum. We have to be able to communicate effectively—orally and in writing—to each other, to engineering students, and to non-engineers."

Greg Kirsch
University names Anthony Hines dean of College of Engineering

The University of Iowa has named Anthony Hines dean of the College of Engineering, effective December 27, 1999.

Hines came to the University from Navistar International Transportation Corporation where he had been group vice president of engineering, product development, and manufacturing operations. Previously, he served as dean of the College of Engineering and Lloyd and Margaret Ketcham Professor at the University of Missouri, Columbia, from 1987-1992.

"Dean Hines brings a deep and unique combination of skills and experiences to Iowa. He has not only been a successful dean and faculty member, he has inside experience in corporate America which will allow him to lead the academic and research enterprises of the College of Engineering with a keen eye toward preparing our students for leadership roles in the real world," University of Iowa Provost Jon Whitmore said.

Hines said that he is pleased to accept the leadership position of the College of Engineering.

"I believe the college has an exceptional faculty and staff and an outstanding student body. I look forward to working with the faculty in helping the college to become even better recognized than it already is," He said.

Hines earned his bachelor's degree in 1967 from the University of Oklahoma, his master's degree in 1972 from Oklahoma State University, and his doctorate in 1973 from the University of Texas at Austin. In 1973, he began his academic career as an assistant professor of chemical engineering at the Georgia Institute of Technology. Hines then moved to the Colorado School of Mines, where he became an associate professor in 1977. He went on to serve as professor and head of chemical engineering at the University of Wyoming and as associate dean for engineering research at Oklahoma State University.

His professional activities include membership in the American Society for Engineering Education, the American Association for the Advancement of Science, the International Adsorption Society, the National Society of Professional Engineers, and various engineering honor societies. He is also a registered professional engineer.

His research interests include diffusion and macroscopic mass transfer. He has served as a consultant to various corporations, including Phillips Petroleum, the Solar Energy Research Institute and the U.S. Department of Energy.

Hines' selection follows a yearlong search by a committee chaired by Jerry Schnoor, professor of civil and environmental engineering and a former member of the Engineering Faculty Council, the college's elected faculty governance organization.

Hines succeeds Richard K. Miller, who served as dean for five years and resigned to become president of Franklin W. Olin College, a new engineering college to be located in Needham, Mass.

IIHR water projects course in China

China was the focus of the third course in the Iowa Institute of Hydraulic Research (IIHR) series "International Perspectives in Water Resources Planning," held on the UI campus and at various locations in China, May 20-June 3, 2000.

Jacob Odgaard, associate dean of the College of Engineering, professor of civil and environmental engineering, and IIHR research engineer, and You-Khan Zhang, IIHR research engineer and associate professor of geology, led the course, with Lea Vanderselde, professor of law.

Course participants met Chinese students, attended seminars, and visited technical, historical, and cultural sites. A special emphasis of the course was the Three Gorges Project, which will be the largest hydroelectric power installation in the world.

"The Three Gorges Project presents a good study of the differences in project planning between China and the U.S. and for that matter between China and many other countries in the world," said Odgaard prior to the course.

Participants also visited the universities that collaborated with the UI on course planning: Wuhan University of Hydraulic and Electrical Engineering, Tsinghua University in Beijing and Hehai University in Nanjing.

The IIHR created the series in 1997 to help students understand first-hand the range of non-engineering factors that have an impact on water resources projects. Information on the series and other projects of the IIHR is available at www.iihr.uiowa.edu.
Joint initiative promotes software development education, outreach, research

How do you equip students for a field that reinvents itself every few years? It may sound like a riddle, but it's the real-world challenge of the software development field, and faculty from The University of Iowa's Colleges of Engineering, Business, and Liberal Arts believe they have come up with an exciting answer, a joint initiative called Software@Iowa.

As computers continue to transform business and industry, software has emerged as a key technological factor in Iowa's economy. About five years ago Jon Kuhl, professor of electrical and computer engineering, and other UI faculty became concerned with what they saw as a growing mismatch of their students' skills and industry needs. They were also tired of watching engineering graduates leave Iowa for lucrative opportunities elsewhere. "We wanted to fundamentally impact the way software professionals are trained, and at the same time help students see that state-of-the-art software development is happening in Iowa," he says.

Kuhl points out that traditional academic curricula teach immutable principles quite well but cannot keep up with fast-paced conceptual changes. To help students understand and acquire the skills of practicing software professionals, the creators of Software@Iowa have designed "studio" courses taught by college faculty and business professionals (called "industrial mentors"). The courses, intended for advanced undergraduate students and graduate students, will eventually constitute a certificate program, similar to that offered by the University's John Pappajohn Entrepreneurial Center, that can augment the curricula of other departments.

If interest in the first course is any indication, the future looks promising. Professor Kuhl, with Roger Shultz, software architect at Diversified Software Industries, Inc. and president of the Iowa Software Association, and David Eichmann, assistant professor of library and information science, chose to enroll students by invitation only, required those invited to submit resumes, and still had to turn away as many as they selected. The lucky 21 studying "Web-based System Development" last spring worked in teams on realistic industry problems.

In line with the outreach emphasis of the program, Kuhl and Shultz, co-directors of Software@Iowa, envision future offerings delivered through the fiber optic system of the Iowa Communication Network. One event has already met outreach objectives quite successfully. The program's First Annual Iowa Software Summit, co-sponsored by Software@Iowa and the Iowa Software Association, brought together more than 100 representatives of government, education, business, and industry last December. With this and other special events, program planners hope to foster university-industry contacts that will lead to research relationships similar to those in Silicon Valley or the Research Triangle.

Kuhl emphasizes the non-proprietary, collaborative approach that has characterized the project from the beginning. Partnerships, according to Kuhl, will also sustain the initiative's longterm health through an Industrial Affiliates program. He explains that affiliate support can take several forms, from paying membership fees, to supplying course mentors, or offering practicum sites. Funding from affiliates will also ensure that the program operates with the necessary state-of-the-art hardware and software.

National Computer Systems, Inc. (NCS) of Iowa City was one of Software@Iowa's Charter Affiliates, a decision that "simply made sense," according to Rich Lineback, director of Systems Development at NCS. He describes the initiative as "a win-win-win situation for the University, its students, and local industry. It fits well with the core principles of our business and represents the next step in our long partnership with the University." The other Charter Affiliates were Rockwell-Collins, Oakdale Systems, Diversified Software Industries, Inc., and National Computer Systems, Inc.

Kuhl hopes affiliates will see the benefits and opportunities of participating in the program. "Here's a chance for them to share their knowledge and expertise," he says, "as well as enhance the visibility of their companies with students. Plus," he adds, "they'll meet some really outstanding students who could become excellent future employees." He urges anyone with an interest in becoming an affiliate or an industrial mentor to contact him or one of the other Software@Iowa principals (contact information can be found on the program's website at www.biz.uiowa.edu/softwareiowa).

The new center and faculty may be "virtual," but the benefits will be real and lasting. "Students are grateful for this exposure to the real world," Kuhl says. "We need to teach them how to track technology and constantly reeducate themselves, so they won't become obsolete in this fast-paced field."
If creativity in the naming of engineering projects could ensure their success, the reputation of the GROK Lab would be guaranteed. While the Lab’s original work in virtual reality was accurately described as “Graphical Representation of Knowledge,” Director Geb Thomas, assistant professor of industrial engineering, actually chose “grok” for its contemporary meaning and usage (global understanding, exhaustive knowledge) and then turned it into the acronym.

The year’s GROK Lab focus has been “Project Marvin.” Named by the students after a Warner Brothers cartoon character, the project was designed to test technology for use in future NASA missions to Mars. Last August, 12 students and two faculty members on the Project Marvin team traveled to north central Utah to test robotic technology and three prototype instruments.

The ThrowCam, as the name makes clear, can be launched at distant objects or inaccessible sites and transmits video footage in its flight. A Mars-like site was identified amid the geologically diverse terrain, and the camera was repeatedly thrown toward several target rocks. The ThrowCam video allowed more accurate conclusions than could have been made from distant images only.

The team also tested a pan/tilt camera. Their objective was to design a software program that would allow full control of the mechanism and correct the image distortion that has plagued other units.

The ultimate purpose of the third instrument, the EndoCam, is to detect life on Mars. Like its surgical cousin, the EndoCam is a lens at the end of a long, flexible fiber optic bundle. It will be able to maneuver under the red dust on the planet surface, snaking deep into holes and fractured rock where fossils or even microscopic life might be found. The instrument can detect certain life-indicating chemicals as well as capture images.

Lab Director Thomas reports that results of the EndoCam tests were promising enough that a formal proposal will be submitted to NASA to seek funding for further development. If the proposal is approved, the team will tackle the technical challenges of mounting the instrument on a robot and assuring sufficient power and heat for its operation in the Martian environment.

Thomas was not deterred by the recent, well-publicized failure of the Mars Polar Lander mission. “This is all such high-risk research,” he points out. Although many competing types of instruments are in development, the EndoCam’s goal makes it important the project. “Finding signs of life on Mars would be one of the most profound things,” he said. “Any instrument that’s headed in that direction has a high priority.”

This is not the first time that Thomas and UI GROK Lab engineering students have been involved in a robotic project involving simulated Martian terrain. In June and July 1997, a Carnegie Mellon University-designed robot, called Nomad, conducted a 45-day, 120-mile trek across the Atacama Desert in Chile to test its durability and versatility for future trips to the moon and Mars. Thomas and the UI GROK lab developed the computer interface that allowed visitors to a Pittsburgh lab to control the robot via remote control. In addition, the GROK lab is currently part of a “dream team” of robotics laboratories working on Pioneer, a robot designed to enter the ruined Chernobyl nuclear reactor in an effort to help Ukrainian engineers assess structural damage.

For more information about the GROK Lab and Project Marvin, visit the GROK Lab web site at http://grok.ecn.uiowa.edu.
Three professors honored for contributions to UI College of Engineering

Three University of Iowa professors received 1999 College of Engineering awards for their individual contributions to research, teaching and service.

The three are Gregory Carmichael, professor of chemical and bio-chemical engineering, for research; Thomas Casavant, associate professor of electrical and computer engineering, for teaching; and Jerald Schnoor, professor of civil and environmental engineering, for service.

Carmichael, who came to the University in 1978, is codirector of the UI’s Center for Global and Regional Environmental Research (CGRER) and an internationally recognized authority on air quality and atmospheric chemistry modeling. His extensive list of conference presentations and invited lectures and seminars includes a 1998 seminar on “Asia Development and the Environment” for members of Congress and agency planners in Washington, D.C. Also in 1998, he became the first recipient of the Recognition Award given by the Sixth International Conference on Atmospheric Sciences and Applications to Air Quality.

An expert on transboundary air pollution in Asia, he has worked with the World Bank and the United Nation’s World Meteorological Organization and is among a select few researchers helping that organization develop a strategic plan to deal with global climate change.

He has received national research grants and awards from the NASA, the U.S. Department of Energy, and the Dreyfus Foundation and is the lead researcher in a recently submitted National Science Foundation grant application on laser-based technologies for environmental applications. His work has resulted in one patent and has been supported by more than $3.5 million in awards from industry and state and federal agencies. Carmichael consults regularly for several American industries and agencies, as well as organizations in Canada, Japan, and Europe.

Casavant, who came to the University in 1989, directed the UI Parallel Processing Laboratory in 1993-94 and, since 1996, has been the director of UI Computational Molecular Biology in Gene Discovery and Disease Gene Identification.

In receiving the award, Casavant’s teaching abilities were recognized by the many students who seek out his courses and give him consistently high evaluations. Also, he has mentored more than three dozen undergraduate students during honors projects, special investigations, and individual studies. His enthusiasm for teaching extends beyond the classroom to the social events that he hosts for his undergraduate students and his participation in extracurricular activities, such as the annual student programming contest.

In addition to being an excellent teacher, he has led the effort to upgrade and modernize the content of courses. For example, he successfully revised the computer content in the undergraduate electrical and computer engineering curriculum and designed and implemented new laboratories for the courses. Despite a heavy research burden, he continues to improve the curriculum, as shown by his writing several hundred pages of web-based notes for an undergraduate core course.

Schnoor, a UI faculty member since 1977, is the F. Wendell Miller Distinguished Professor of Civil and Environmental Engineering in the University of Iowa College of Engineering and codirector of CGRER. The most recent of his numerous honors was his 1999 election to membership in the National Academy of Engineering, the profession’s highest honor.

Schnoor has served as one of three faculty representatives on the University’s Strategic Planning Steering Committee and as chair of the Department of Civil and Environmental Engineering, 1985-90; as president of the Faculty Council and Senate, 1993-94; as secretary of the Faculty Council and Senate, 1986-87; and on numerous committees. His service to students includes mentoring high school students at summer programs and working with many undergraduate engineering students in his research programs.

He has research interests that include water quality modeling, hazardous wastes remediation, and global atmospheric trace gases. He is the coauthor of more than 100 journal articles, editor of four books, and author of Environmental Modeling (John Wiley and Sons, 1996), adopted as a text by more than 50 graduate programs throughout the United States, Europe, Asia, and South America. He is an international authority on environmental engineering, having led many international projects, testified before Congress on several occasions, and served as an advisor to William Ruckelshaus, Administrator of the Environmental Protection Agency, on issues involving acid rain.
$7.1 million NIH grant

A multi-disciplinary team from the Colleges of Engineering and Medicine has been awarded a 7.1 million-dollar grant from the National Institutes of Health (NIH). Eric Hoffman, professor of radiology and biomedical engineering, leads the team working on image- and model-based analysis of lung disease.

Among the co-investigators are Milan Sonka, associate professor of electrical and computer engineering, and Joseph Reinhardt, assistant professor of biomedical engineering.

The grant brings to The University of Iowa a state-of-the-art high-speed multi-slice helical X-ray CT scanner, built by Marconi Medical (formerly Picker International). The dynamic, three-dimensional images the scanner provides will help the research team develop highly sensitive methods for measuring the detailed structure and function of the lung.

Hoffman explains that a primary goal is to construct three-dimensional models for normal male and female lung tissue, airways, airflow, blood vessels, and blood flow, then develop analytical methods to compare individual patients with the model.

Reinhardt and Sonka plan to use the lung model as an anatomic "atlas" to guide three-dimensional computer-based image analysis. They are developing image-analysis software that will automatically identify the lungs and major internal pulmonary landmarks as well as identifying the three-dimensional airway tree in the CT images. These software tools will be integrated into a fully automatic system for pulmonary image analysis.

Grant funds support collaboration with investigators at the Mayo Clinic (Rochester, Minn), Marquette University (Milwaukee, Wis), The Johns Hopkins University (Baltimore, Md), and Purdue University (West Lafayette, Ind). Faculty from these universities will come to The University of Iowa to use the new scanning facility and help develop the computer-based tools to evaluate the CT images.

The award is one of the first in NIH's Biomedical Research Partnership program, which supports basic bioengineering research into important biological or medical research problems. The UI collaboration meets the NIH requirements of a multidisciplinary team that includes bioengineering expertise and uses an integrative, systems approach to develop detection and diagnostic tools.

L.D. Chen named Director of National Advanced Driving Simulator

The University of Iowa has named L.D. Chen, professor of mechanical engineering, director of the National Advanced Driving Simulator (NADS) project.

Chen, who has served as interim NADS director since October 1998, was selected following a nationwide search. NADS, formally scheduled to open next fall, is expected to become the world's leading center for driving simulation research, including the study of human factors associated with both on-road and off-road vehicle dynamics and driving safety.

Currently nearing completion at the University of Iowa's Oakdale Research Park, NADS will be the world's most advanced driving simulator for researching safety issues, such as the effects of medical conditions on drivers, and designing safer highways and vehicles without the need to construct expensive prototypes.

Researchers from medicine, engineering, computer science, and other fields will conduct interdisciplinary research aimed at reducing the estimated 90 percent of all vehicle crashes in which human behavior is a factor. NADS is useful to researchers from government, industry, and academia for the study of such phenomena as the effects of fatigue, aging, medical conditions, impairments, vehicle engineering, and highway design on driver performance.

The $56 million project includes a $44 million federal government contract with TRW Inc. of San Diego, Calif. to construct the simulator; University and state contributions, including the building and software, contribute about $12 million.

The National Highway Traffic Safety Administration (NHTSA), through a nationwide competition conducted by the National Science Foundation under an interagency agreement with NHTSA, selected The University of Iowa as the site for NADS in 1992 and is developing it as a cooperative venture with the University. NADS was originally conceived by Edward Haug, Carver Distinguished Professor of Engineering, who is currently engaged in NADS research program development.
Scranton joins College as chair of Chemical and Biochemical Engineering

Alec B. Scranton has joined the UI College of Engineering as professor and chair of the chemical and biochemical engineering department. Most recently, he served as associate professor of chemical engineering at Michigan State University, East Lansing, Mich.

Professor Scranton brings an extensive background of expertise in polymer research to The University of Iowa. Prior to his appointment as associate professor at Michigan State, he served as assistant professor at The University of Iowa in 1984.

In his career to date, Professor Scranton has won the American Society for Engineering Education J.J. Martin Award, the Johanen Crosby Endowed Professorship, the American Institute of Chemical Engineers Outstanding Professor Award (twice), and the Dow Chemical Company Environmental Enhancement Award. He was elected twice to serve on the Executive Committee of the American Chemical Society, Division of Polymeric Materials: Science and Engineering. He has authored more than fifty publications and holds six patents.

Butler to chair Mechanical Engineering

P. Barry Butler, professor of mechanical engineering, has been appointed chair of the mechanical engineering department. Butler joined the University in 1984. He served as associate dean of academic programs, August 1997 - February 1999, and as interim dean from February 1999 until December 1999.

A nationally recognized expert in thermal science and energetic materials, Butler has played a key role in reshaping the curriculum at the college. Butler is an associate fellow in the American Institute of Aeronautics and Astronautics and a member of The Combustion Institute, the Society of Automotive Engineers, the American Society of Mechanical Engineers, the Fine Particle Society, the Iowa Academy of Science and Pi Tau Sigma. He received the Ralph Teetor Award from the Society of Automotive Engineers in 1991.

Butler earned his bachelor's and master's degrees in aeronautical and astronautical engineering in 1979 and 1981, respectively, and a Ph.D. in mechanical engineering in 1984, all from the University of Illinois at Champaign-Urbana.

Ettema to chair Civil and Environmental Engineering

Robert Ettema has been named chair of the Civil and Environmental Engineering Department. He joined the University in 1980 and has served as interim department chair since March 1999. Ettema also served as interim director of the Iowa Institute of Hydraulic Research from 1991 until 1994. His major research areas are cold regions engineering, hydraulic engineering, river engineering and water-resources engineering.

He received his B.E. (1st Class Honors) and M.E. (1st Class Honors) degrees from the University of Auckland, (New Zealand) in 1976 and 1977, respectively. Ettema gained his Ph.D. in civil engineering from the University of Auckland in 1980.

In his career to date, he has won the Gustave Wilhlims Award, Best Paper, U.S. Section, Permanent Association for Navigation Congresses and the American Society of Civil Engineers, Task Committee Excellence Award, Symposium on Hydraulics Instrumentation and Experimentation.
1930s
Harvey G. Sennert (BS 1939 in electrical engineering) summarized his professional career as follows: Interstate Power Company, Dubuque, Iowa, employed him from 1939 to 1940. During WWII he was a radar development officer with the U.S. Air Force, Wright Field, Dayton, Ohio. Following the war he worked on many research and development projects in the same location. From 1954 to 1981 he worked for Lockheed in Van Nuys and Sunnyvale, Calif., on research and development projects, principally classified satellite programs.

1940s
Charles K. Hurst (MS 1940 in mechanics and hydraulics) served as chief engineer of public works of Canada retiring from his water career in 1975. During his professional career he received the Citizenship Award from the Professional Engineers of Ontario, the Medal of Merit from the Canadian Ports and Harbours Association, the Bicentennial Award from the Province of Ontario and finally the Governor General’s Caring Canadian Award.

Edward F. Wright (BS 1948 in mechanical engineering) is living in Nellysford, Va. He retired after 39 years with Caterpillar.

1950s
Edward F. Diekmann, Jr. (BS 1952 in civil engineering) is a self-employed consulting structural engineer in Kingston, Calif.

Philip G. Hubbard (BS 1946 in electrical engineering, MS 1949, PhD 1954 in mechanics and hydraulics) published My Iowa Journey: The Life Story of the University of Iowa’s First African American Professor. The book follows the path of his life, recounting childhood, his role as student, professor, administrator and humanitarian at the University of Iowa. Hubbard’s major accomplishments included policies that focused on human rights; these policies transformed the makeup of students, faculty, and staff by seeking to eliminate discrimination based on race, religion, or other nonacademic factors.

David W. Bulechek (BS 1956 in mechanical engineering) is Chairman and CEO of Sarancon, Menlo Park, Calif.

Robert P. Utter (BS 1957 in mechanical engineering) retired from his job as staff engineer at Scotsman Industries, Inc. In September 1999 he formed I.C.E. Consulting Services and is currently doing consulting work in mechanical and refrigeration systems.

William H. Busch (BS 1959 in civil engineering) retired from the Illinois Environmental Protection Agency. Through the years he has served as president of the American Academy of Environmental Engineering, president of the Council of Engineering and Scientific Specialty Boards and on the Board of Directors of the Water Environment Research Foundation.

1960s
Louis E. Becker (BS 1957, MS 1961 in civil engineering) is president of Vertex Antenna Systems, Santa Clara, Calif.

Donald A. Gurnett (BS 1962 in electrical engineering), University of Iowa professor and space physicist was awarded a $4 million NASA contract in collaboration with the Jet Propulsion Laboratory in Pasadena, Calif. to develop and use radar in a search for underground water on Mars. The investigation is part of an international project aboard the European Space Agency’s Mars Express spacecraft scheduled for launch in 2003.

Wayne Paulson, (PhD 1965 in civil and environmental engineering) professor of civil and environmental engineering, retired after almost 40 years of service to The University of Iowa. The department noted him as “a stalwart for our program in environmental engineering and science in so many ways, and he has influenced greatly the careers of many of our graduates. By helping students find jobs and by tracking their careers afterwards, he has helped us to remain a family; and for that we will be forever grateful to him.”

Richard K. Riley (BS 1961, MS 1965 in mechanical engineering) retired after 21 years with Phillips Petroleum Research and Development. He has relocated to Friday Harbor, Wash., an island in Puget Sound.

L.D. McMullen (BS 1968 in civil engineering, MS 1972, PhD 1975 in environmental engineering) was appointed to the advisory board of the new University of Iowa College of Public Health.

1970s
Richard E. Larew (BS 1953 in mechanical engineering, MS 1973 in industrial engineering, PhD 1976 in industrial and management engineering) professor emeritus, civil and environmental engineering, Ohio State University earned the Brian D. Dunfield Education Service Award from the Association for the Advancement of Cost Engineering.

Wayne G. Fethke (BS 1971 in industrial engineering) recently retired as President and CEO of Fiskars, Inc., Middleton, Wis. While he attended the 350th Anniversary of Fiskars Corporation of Finland, his Excellency, the President of the Republic of Finland, Mr. Martti Ahtisaari, honored Wayne with highly regarded orders, awarding him the Knight’s Cross, 1st Class of the Order of the Lion of Finland. The honorary order was presented at the Anniversary Dinner in Fiskars’ Village on Monday, November 1, 1999.

Gerald Hsu (MS 1971 in mechanics and hydraulics) is President and CEO of Award Corporation, Fremont, Calif.

Gary F. Seams (BS 1971 in electrical engineering) hosted the first Student Leadership Seminar at his Galena home. Along with Gary other alumni presenting at the seminar were Philip H. Francis (MS 1960 in mechanical engineering, PhD 1965 in mechanics and hydraulics), and Barb Sines (BS 1980 in industrial engineering). Attendees included students from the College of Engineering and the College of Business.

Lloyd E. Witte, P.E., (BS 1972 in civil engineering) received the outstanding Government Civil Engineer Award from the Iowa Section of ASCE. He was cited for his work with the city of Des Moines. After graduation, he was employed by the City of Des Moines as a junior civil engineer and was progressively promoted to assistant civil engineer, senior civil engineer, principal civil engineer and deputy director. The last 20 years were spent working as a registered Professional Engineer in the administration of the planning, design, and construction of the Des Moines area-wide WRA sewage treatment and conveyance facilities. He retired in January 1999.

Randy Beavers (BS 1972 in civil engineering, MS 1973 in environmental engineering) was appointed by Governor Tom Vilsack to serve a three-year term on the Iowa Engineering and Land Surveying Examining Board. Beavers is currently employed as Director of Engineering Services with Des Moines Water Works.

1980s
Ching-Ming Chen (MS 1981 in industrial and management engineering) is employed as a principal consultant by Graves and Chen Associates, Inc., Taipei, Taiwan.

Rebecca Lance Svratos (BS 1982 in civil engineering) is employed as a senior project manager for the Industrial Sector by Howard R. Green Company.

During Charles K. Hurst’s (MS 1940 in mechanics and hydraulics) professional career he received the Citizenship Award from the professional Engineers of Ontario, the Medal of Merit from the Canadian Ports and Harbours Association, the Bicentennial Award from the Province of Ontario and finally, the Governor General’s Caring Canadian Award.
Patrick M. Jonas (BS 1982 in civil engineering) has been employed by Harris Corporation, Palm Bay, FL since graduation. His responsibilities include system-level loads development for space structures, finite element analysis using NASTRAN and other FEM codes, structural analysis for weight and stiffness optimization, group leadership of engineers and close interaction with design engineers for mechanism development and testing.

Dharmvir Krishnan Bhatnagar (MS 1984 in civil and environmental engineering) and his brother Ranbir trekked to the base camp of Mount Everest in April 1999. The trek, “an exotic and exhausting experience,” took 8 days up and 5 days down for 28 miles from Lukla, Nepal.

Azam Barkatullah (MS 1984 in electrical and computer engineering) is the tech readiness program manager with Intel Corporation, Santa Clara, Calif.

Mark P. Burwell (BS 1985 in mechanical engineering) is a major in the United States Air Force assigned to OSI Detachment 102 at Hanscom Air Base, Mass.

Kevin K. Drees (BS 1985 in civil engineering) has worked for Fresh Express (produce packaged salads) since February, 1999. He was hired as the process engineer; gained additional responsibilities in the maintenance department and was promoted to manufacturing manager; gaining additional responsibility of the manufacturing department.

Michael J. Spear (BS 1986 in chemical engineering) was promoted from paint specialist, corporate offices to engineering manager for the Paint Center at Daimler-Chrysler St Louis, assembly plant.

John P. Kepros (BS 1987 in biomedical engineering) is a trauma surgeon at Swedish Medical Center; Englewood, CO.

Kevin S. Smith (BS 1988 in biomedical engineering) is a consultant in anatomic and clinical pathology with a special emphasis in dermatopathology with Carolinas Pathology Group at Carolinas Medical Center; Charlotte, NC.

1990s

Robert D. Foote (BS 1990 in mechanical engineering) is an information technology manager at Isola Laminate Systems, LaCrosse, Wisc.

Subbiah Sundaram (MS 1993 in electrical and computer engineering) is a manager with Veritas Software, Mountainview, Calif.

Jamie A. Knutson (BS 1994 in civil engineering) is an associate engineer with the City of Waterloo, Iowa.

Brian D. McKinney (BS 1994 in industrial engineering) is an internet center of excellence manager employed with Andersen Consulting in San Francisco.

Stefan F. Hofmeyer (BS 1994 in industrial engineering) is the principal business analyst for Inventa Corporation, Redwood Shores, Calif.

Scott Willson (BS 1996 in civil engineering) is a project engineer with Manhard Consulting, Ltd, Vernon Hills, Ill. The firm specializes in site development (residential, commercial and industrial), land planning and surveying. Scott was on campus for Career's Day to recruit College of Engineering students.

Jim Jordan (PhD 1997 in civil and environmental engineering) was named to the Soil Science Society of America's Council of Soil Science Examiners. He currently works as a soil and environmental scientist in Portland, Ore.

Didik Wahjudi (MS 1997 in industrial engineering) is a lecturer in the mechanical engineering department at the Petra Christian University in Surabaya, Indonesia.

Entrepreneurs Steven M. Zellers (MS 1997 in industrial engineering) along with partners Rick Olauson and Steve Pollack founded Verdelic, LLC in November 1998. Verdelic, LLC is a full-service urban simulation company specializing in products that allow architects and developers to demonstrate what a proposed project will look like before construction starts. Using advanced computer graphics and simulation technology Verdelic develops real-time, "walk-through" simulations of planned construction and real estate projects. The State Board of Regents, State of Iowa approved a lease that will enable Verdelic, LLC to become a corporate affiliate of the University of Iowa Technology Innovation Center on the Oakdale Research Campus.

Tony Mirchandani (BS 1998 in electrical engineering and a recipient of a Technological Entrepreneurship Certificate) recently left his business analyst position at HON Industries to open a start-up venture with new business partner Joy Steube, who graduated this past spring from the University. They recently unveiled Disability-city.com, an e-commerce company that provides information to people with disabilities.

Michael E. Brammer (MS 1998 in biomedical engineering) is the onsite OEM exhaust account manager for Fleetguard Nelson, a manufacturer of filtration products and exhaust systems for heavy-duty applications. Brammer will have an office onsite at John Deere's Product Engineering Center, Dubuque, Iowa.

Jeffrey A. Hopp (MS 1998 in civil and environmental engineering) is a design engineer with Redwine-Reitzin, Inc., Avon, CO. Some of his project highlights include Denver commercial projects, Vail Valley Custom Homes, and Skier Services Buildings at Copper Mountain in Colorado.

Binh Q. Tran (PhD 1998 in biomedical engineering) won a 1999 Procter & Gamble professional Opportunity Award for cardiovascular research work. He is a graduate research assistant in the Department of Radiology at The University of Iowa Hospitals & Clinics.

Erin M. Schacht (BS 1999 in civil engineering) is a civil engineer in the public works department of Westwood Professional Services, Inc. in Eden Prairie, Minn.

Aimee Lockhart Matthys (MS 1999 in civil engineering) is a civil/environmental engineer at North American Wetland Engineering, Forest Lake, Minn.

Todd W. Penisten (BS 1999 in civil engineering) was promoted to a new environmental engineering position with Veerstra & Kinn, Inc., West Des Moines, Iowa.

Jonathan P. Fitch (BS 1999 in civil engineering) is employed by Shive-Hattery, Inc., Iowa City, Iowa. His responsibilities include structural design, construction observation and construction management for a wide variety of projects.
In Memoriam


Howard Kimble (BS 1907 in civil engineering). February 18, 1970.


Marvin J. Webster (MS 1937 in mechanics and hydraulics). February 27, 1996.


Robert Tibor, college of engineering coordinator of the Program for Enhanced Design Experience (PEDE) and Virtual International Design (VID) projects was named Iowa Governor Tom Vilsack's special advisor in building strategic alliances that will help meet the challenges of a technology-driven economy. Tibor will help organize a technology advisory network and guide a new statewide initiative aimed at nurturing innovation and sharing advanced-manufacturing technology breakthroughs.

Engineering Design & Prototyping Center

The Engineering Design & Prototyping Center was involved in the development and fabrication of chambers and instrument mounts used in the Arnold Space Experiment aboard the Space Shuttle Columbia July, 1999 mission.

IIHR

Hunter Rouse, late director of the Iowa Institute of Hydraulic Research and dean of the College of Engineering was featured in the 125th Anniversary issue of Engineering News Record. The editors of ENR identified 125 people for their outstanding contributions to the construction industry since 1874. Besides serving as director of the world-renown Iowa Institute of Hydraulic Research, he led pioneering research in topics such as river sedimentation. In 1961, he arranged the first exchange between directors of hydraulic laboratories in the U.S. and Soviet Union.

Jennifer Dodds, graduate student working with Professor Amy Bradley was awarded a STAR Fellowship from the Environmental Protection Agency. The fellowship provides up to $34,000 annually for three years and covers stipend, tuition and expenses. Dodds is researching "Development of Sustainable Design Concepts for Storm Water Management."
Biomedical Engineering
David G. Wilder, associate professor, was given a secondary appointment in the Department of Occupational and Environmental Health of the new College of Public Health founded July 1, 1999.

Chemical Engineering
Joseph Mohr, senior from Iowa City, received national recognition at the annual American Institute of Chemical Engineering (AIChE) meeting held in Dallas, Texas, as one of only 15 students from across the country to receive an AIChE scholarship, valued at $1,000, for the 1999-2000 academic year. This is the sixth time in the past nine years that a UI student has won an AIChE scholarship.

The University of Iowa American Institute of Chemical Engineers (AIChE) student chapter received the AIChE Outstanding Student Chapter Award for the 1998-1999 academic year. This marks the seventh year in a row the UI group has won the award, which is presented annually to the top 10 percent of student chapters across the nation.

David Murhammer, associate professor, collaborated with UI Professor Mark A. Arnold on a UI experiment that flew aboard the Space Shuttle Columbia's July mission. The project involved an oxygen sensing system that may enable researchers to accurately monitor and study human cell growth and metabolism in space.

Victor G.J. Rodgers, associate professor, was awarded a $13,500 Carver Scientific Research Initiative Grant for his research of "Controlled Release Modeling and Prediction for Single-Dose Vaccination."

Reed Morgan, senior from Cedar Rapids, Iowa, was inducted into the Beta Iota Circle of Omicron Delta Kappa, a national leadership honor society.

Civil & Environmental Engineering
Jerald L. Schnoor, the F. Wendell Miller Distinguished Professor of Civil and Environmental Engineering and Co-director of the Center for Global and Regional Environmental Research, received the engineering profession's highest honor with his induction into membership in the National Academy of Engineering on October 2, 1999 in Washington, D.C.

M. Asghar Bhatti, associate professor, advanced to the grade of Fellow in the American Society of Engineers.

Professors Gene Parkin and Jerald L. Schnoor were given secondary appointments in the Department of Occupational and Environmental Health of the new College of Public Health, founded July 1, 1999.

Lisa Schwartz, junior from Chesterfield, Missouri, was inducted into The Beta Iota Circle of Omicron Delta Kappa, a national leadership honor society.

Electrical & Computer Engineering
Steven C. Mitchell, graduate student working with Milan Sonka, associate professor, presented "Segmentation of Cardiac MR Images: An Active Appearance Model Approach" at the Leiden International Medical Students Conference. The work, co-authored by S. Mitchell, B. Leijendke, R. van der Geest, J. Schaap, J. Reiber and M. Sonka, documented results of a collaborative project between the department of electrical and computer engineering at The University of Iowa and the Division of Image Processing, department of radiology at Leiden University Medical Center, the Netherlands.

Mechanical Engineering
Sharif Rahman, assistant professor, was named associate editor of the American Society of Mechanical Engineers (ASME) Journal of Pressure Vessel Technology.

Sharif Rahman, assistant professor, was named co-winner of the Outstanding New Mechanics Educator Award by the Mechanics Division of the American Society for Engineering Education at the ASEE Annual Conference and Exposition, June 20-23, 1999 in Charlotte, NC.

Building intellectual capital
In the year since I became the director of development for the College of Engineering, I've learned much about the College and its students, faculty, and staff. From New York to Minneapolis/St. Paul, from Iowa City to California, I've enjoyed meeting University of Iowa engineering graduates and supporters.

Nationwide, College of Engineering alumni are working to design a better world. Like Joseph B. Summers (BS 1948 in civil engineering) of Hanford, California (see story on page 2), many of the Iowa graduates I met over the last year have used their engineering education as a building block for developing their personal as well as their professional lives.

This past fall, we put the finishing touches on the Engineering Facilities Campaign. Thanks to generous supporters all across the country, we have exceeded our $11 million goal! As construction progresses on the Seams Center for the Engineering Arts and Sciences, it is inspiring to walk through this magnificent new structure—especially when touring with a group of engineers. (Never before have I seen such interest in an HVAC system!)

While contractors complete their work on the Seams Center, a group of academic “architects” have spent the past year plotting the College's future. Engineering faculty and staff, along with the Engineering Advisory Board, are developing a five-year strategic plan designed to build on the College's intellectual capital—its faculty and students and their shared work in engineering education and research. When the University embarks upon its institution-wide capital campaign, many funding priorities for the College of Engineering will be tied to the College's strategic plan.

One of these priorities recently received a boost, thanks to a generous $1.2 million gift from the Roy J. and Carver Charitable Trust of Muscatine, Iowa. The Carver gift will help the Iowa Institute of Hydraulic Research's work in developing the Mississippi Riverside Environmental Research Station. The facility, which will be the first university-affiliated, comprehensive river research station in the world, will be constructed on the Mississippi River near Muscatine.

Many more exciting projects lie ahead—initiatives that will keep the UI College of Engineering at the forefront of engineering excellence. Such advances are made possible by you—the College's alumni and friends.

I look forward to visiting with many of you in the months ahead. The opportunity to forge partnerships with alumni and friends will make for an exciting year!

For information about making a gift to the College of Engineering, contact Kevin Collins, director of development for the College, c/o The University of Iowa Foundation. Phone 319-335-3305 (toll-free 800-648-6973). E-mail: kevin-collins@uiowa.edu Web site: www.uiowafoundation.org
Excellence. It's the essence of the College of Engineering. That's why we've made an important change—we've renamed our annual development fund the "Engineering Excellence Fund."

We've also designed a new logo to reflect this change. Bold and instantly recognizable, E^2 sums up our College. It evokes excellence in engineering—and the energy we bring to education.

We invite you to help us celebrate our spirit of excellence. By giving to the Excellence Fund each year, you help us build upon our strengths to reach even higher. The fund will give our new dean and his colleagues the resources they need to develop emerging programs, foster cutting-edge research, equip our labs with the best technology available, and provide student scholarships and faculty support. It all adds up to continued excellence. And excellence has always been the cornerstone of the UI College of Engineering.

Help us extend our tradition of excellence into the 21st century—remember to include the Engineering Excellence Fund in your charitable giving plans this year.

The Dean's Club recognizes alumni who contribute $1,000 or more annually to the Engineering Development Fund or other college-wide funds.
The Transit Club recognizes those who contribute from $500 through $999 to the Engineering Development Fund or other college-wide funds.

The MECCA Club recognizes those who contribute from $250 through $499 to the Engineering Development Fund or other college-wide funds.

This honor roll gratefully acknowledges UI Engineering alumni whose generous 1998 contributions qualified them for membership in the UI College of Engineering honor clubs, which recognize high-level annual contributions to the Engineering Development Fund and other college-wide funds. This listing shows UI engineering graduates who qualified for membership in the Dean's Club, the Transit Club, or the MECCA Club during the 1998 calendar year. Other contributors, including spouses of alumni and corporate contributors, will be recognized in the College's annual honor roll of contributors (published each fall) and in the UI Foundation's Annual Report on Giving.
Karl Kammermeyer’s amazing odyssey

When 21-year-old Karl Kammermeyer immigrated to the United States in May 1925, he brought everything he owned in a wooden suitcase. At his memorial service last August the suitcase was displayed as a symbol of Kammermeyer’s European roots, optimism, and determination.

“The odyssey of Karl Kammermeyer,” says Gregory Carmichael, professor of chemical engineering, “is nothing short of amazing.”

Born in 1904 in Nuremberg, Germany, Kammermeyer attended the Technical University of Munich until 1925, when the young politician, Adolph Hitler, sparked the Putsch. Kammermeyer’s widowed mother encouraged her son to emigrate. Shortly after arriving in the United States he joined an uncle in Detroit and began working as a mechanic’s helper at the Fisher Body plant. Factory work helped Kammermeyer learn English and steel his resolve to finish his college studies.

At the University of Michigan in Ann Arbor, he earned bachelor’s degrees in chemical engineering and mathematics in 1930 and a D.Sc. in chemical engineering in 1932. But like thousands of other men of the time, “he graduated from college into the jaws of the Depression. So he mowed lawns and washed glass in the engineering college until he finally landed a job as a chemist at Standard Oil of Indiana,” says Kammermeyer’s son, John.

For the next 17 years, Kammermeyer worked as a chemist in the private sector, at Pure Oil Company, Publicker Industries, and finally the Glenn L. Martin Company, which sparked a lifelong fascination with the nature of differential diffusion across plastic membranes.

“My parents,” John recalls of their arrival on the Iowa campus in 1949, “drove into town in an old yellow Pontiac full of suitcases, a puppy, and me.”

At The University of Iowa, Kammermeyer applied his knowledge of plastic membranes to help perfect the artificial kidney and a prototype heart-lung machine. A gifted teacher, Kammermeyer engaged students and colleagues in laboratories, offices, and hallways. He helped launch many a private sector career by collaborating with students on research. Fanning out across the corporate and academic landscapes, his students never forgot their teacher and mentor. Many continued to visit him on every return to Iowa City.

Kammermeyer died August 6, 1999 of complications from a series of strokes. Two of his former students—William Liike and William Pagel—recalled that during a recent visit, their mentor turned to them and said, “Boys, you are old enough now. Please call me ‘Karl.’ ”

“Since I was about 65 years old at that time,” Pagel laughs, “it was extremely nice of him and made me very happy.”

“Like the cigar smoke that followed him everywhere,” Carmichael noted, “Professor Karl Kammermeyer’s spirit permeates throughout the department, and is permanently absorbed into the fabric—or more appropriately, the membrane—of what and who we are.”