



INQUIRY

Information from the frontiers of knowledge

A magazine highlighting research at the University of Oregon

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A Message About Research From



STEADMAN UPHAM

**Vice Provost for Research and Graduate Education
and
Dean of the Graduate School**

. Much research in the United States, especially basic research, is done in universities by talented faculty members who work at the frontiers of knowledge. At the University of Oregon, research lies at the heart of academic life, helping us to define a fundamental part of our mission as "the creation of knowledge."

. But knowledge is not useful unless it is put to work. At the University of Oregon, we make sure that the new knowledge we create—the inventions, discoveries, and artistic creations that emanate from our faculty—are presented to students as part of their academic course work. Because our faculty is actively expanding the frontiers of knowledge in every discipline, all UO students benefit from research conducted on campus.

. We also work directly with business, industry, and government to transfer faculty inventions and discoveries to the commercial sector so our innovations and new knowledge can benefit the public. The scope and reach of this work is substantial and growing.

. Research and technology transfer are part of Oregon's economic future. But their importance goes beyond the borders of Oregon, affecting the lives of people around the world who may never have even heard of the University of Oregon.

. That is the beauty of research. Much of it is transparent, integrated into the fabric of daily living. At the University of Oregon, however, we understand that research is the foundation for learning and a key to the economy of the future.

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Business Is Booming at the University of Oregon

. Few students at American universities are as thoroughly trained in the art of entrepreneurship as those graduating from the University of Oregon's Charles H. Lundquist College of Business.

. "What makes us special is the extent to which entrepreneurial attitudes, strategies, and energies color every aspect of what we do," says Dean Tim McGuire. "Our program celebrates individual enterprise, the faculty encourages it, and our students get to experience it firsthand."

. Since being named dean in 1994, McGuire has worked to reinvent and revitalize the business college. Under his guidance, entrepreneurial thinking has become a staple for the college's 1,700 undergraduates and 200 graduate students.

. The first year of an M.B.A. student's course of study, for example, is organized around working with a functioning company to develop a business plan for a real product. Students take courses in a sequence that supports and reinforces their entrepreneurial activities.

. "I call this the Just-in-Time educational philosophy," McGuire says. "It ensures that students have a real-world application for everything they learn as they learn it."

. This approach is helping the college earn widespread recognition. *U.S. News & World Report* recently placed Oregon's undergraduate program among the best of the best, ranking it in the top 3 percent in the nation.



DEAN TIM MCGUIRE & STUDENTS

THE CHARLES H. LUNDQUIST
COLLEGE OF BUSINESS
DEVELOPS STUDENT
ENTREPRENEURS IN ITS
TOP-RANKED BUSINESS
PROGRAM

. Another contributor to these impressive rankings is the Lundquist Center for Entrepreneurship. Established in 1989, the center links the academic and business communities and, according to Director Mark Lange, "provides students with an entry to the world marketplace as it really exists, with its dazzling opportunities, its cavernous pitfalls, and its infuriating unpredictability." Last year, the center was recognized by *Success*

magazine as one of twenty-five up-and-coming entrepreneurship centers in the country.

. A sampling of the center's offerings includes

- **New Venture Competition** In this annual event, cosponsored by Bank of America, college business students from the western states compete for \$10,000 in prizes by impressing a panel of judges and venture capitalists with creative business plans.
- **Key Industry Data Base** In partnership with *Oregon Business* magazine and AT&T, students from the center compiled the most detailed data bank ever assembled about the fourteen key industries the Oregon legislature earmarked as essential to the state's economic future. (The database is available on the Internet at <http://www.oregonbusiness.com>)
- **Internship Program** Each summer about 20 M.B.A. students sharpen their planning, marketing, and management skills by working full time with fast-growing Oregon firms. This summer undergraduates will join the program.

. "These kinds of programs," Lange says, "expose our students to a much richer learning environment than that which can be created in the classroom alone."

. One of McGuire's favorite mottoes is Practice What You Teach. What better way is there to instill in students the knowledge, skills, behaviors, and attitudes of an entrepreneur than for the college and its faculty to model it? A good example of this modeling is the center's New Venture Network. Conceived only last year, the network aims to identify and develop promising new-venture projects; recruit qualified participants from the college, university, and business community; and help negotiate contracts to further the project. In the true spirit of the entrepreneur, the college will take equity in the projects it helps develop.

. Program director and professor of management Alan Meyer is impressed by the experience the network offers students. "New Venture students learn as they do business and do business as they learn. It is a remarkable synthesis," he says.

. Why the strong emphasis on developing students' entrepreneurial spirit at the Charles H. Lundquist College of Business? Dean McGuire explains that, while most business graduates will not be directly involved in what is traditionally thought of as entrepreneurial activity (starting a company, for example), all will benefit from an enterprising spirit. "Today," he affirms, "virtually all businesses must act entrepreneurially. Having these skills and this important experience gives our students a significant competitive advantage."

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Stalking a Killer: Researcher Targets Deadly Foe



JOHN KEANA

. In his own soft-spoken way, John Keana is an extremely ambitious man. His goal? No less an achievement than stopping the ravages of stroke-the nation's third most prevalent killer-and traumatic head injury. A professor of chemistry at the University of Oregon, Keana uses his thirty years of laboratory experience to design drugs that can stop brain damage before it stops its victims.

. "What happens during a stroke or traumatic head injury," Keana explains, "is that brain cells are deprived of oxygen-often by a blood clot or hemorrhage. This wouldn't be so bad if the damage remained localized, but when the smothered cells die they release a substance that overexcites their neighboring cells and causes them to die and release still more of the substance. It's a chain reaction."

. This domino effect can continue for hours or even days. As the cell death slowly ripples through an area of the brain, it may lead to widespread paralysis, inability to speak, coma, or death. Each year stroke afflicts 400,000 Americans and kills 150,000.

. Doctors tending to stroke and head-trauma victims have few effective options. No existing drug treatments can keep the dominoes from falling.

. Keana and his UO research team, working in collaboration with Eckard Weber, a pharmacology professor at the University of California at Irvine, have developed two neuro-protective drugs. The first, called Cerestat, erects a chemical barricade that shields the still-standing dominoes from those that are tumbling.

. A second-generation compound, ACEA 1021, works, in essence, by gluing the dominoes in the standing position; that is, once ACEA 1021 is administered, healthy cells are prevented from succumbing to the destructive chain reaction.

. Both drugs are currently undergoing U.S. Food and Drug Administration testing.

. "FDA testing is an extremely involved set of tests and assessment that usually takes many years and can cost \$300 million," Keana says. "The university, of course, has neither the means nor the mission for such an undertaking, so we partner with private corporations, usually early in the research phase."

. The UO holds partial patent rights to both Cerestat and ACEA 1021; private companies have signed license agreements for the compounds. Keana points out that research support from out-of-state pharmaceutical corporations is spent in Oregon on equipment, supplies, and the salaries of researchers.

. "And, should one of these drugs make its way to market, the university would stand to earn substantial royalties," he notes.

. In the meantime, university students are reaping the benefits of Keana's expertise. The lectures for his sophomore organic-chemistry class of 350 students are peppered with his real-world experience in such areas as writing grants, conducting original research, and publishing results in peer-reviewed journals.

. Each year a small number of undergraduates work in Keana's laboratories, gaining practical experience in building complex molecules. It was a UO undergraduate who, under Keana's supervision, first synthesized ACEA 1021.

. Even as the first two antistroke drugs are being tested, Keana's research group is at work on a third-generation compound with more specific targeting and action.

. "While personal tragedies will still occur, stroke and head injuries will be much less devastating to the population as a whole in five or ten years due to the research that is going on today both here at the UO and elsewhere," he says. "That's a promise."

NEW DRUGS DEVELOPED
AT THE UNIVERSITY OF
OREGON ARE DESIGNED
TO SAVE LIVES, LESSEN
SUFFERING

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Getting the Most out of Telecommuting

. While telecommuters are generally 10 to 20 percent more productive than traditional employees, the practice is not without its problems. For example, managers of telecommuters can find themselves in the unfamiliar position of supervising employees they rarely-if ever-see, says Nancy Melone, a ssociate professor of management at the Charles H. Lundquist College of Business. Melone is conducting research on telecommuters and their managers.

How common is telecommuting?

NM: A 1993 study found that 8.4 million employees telecommuted at least eight hours a week, an increase from fewer than one million in 1985. More recently, a well-known consulting firm, the Gartner Group, estimated that by the year 2000 there will be more than thirty million telecommuters.

How are managers responding?

NM: Recent studies suggest that managers are unsure of their new roles in these more decentralized work relationships. The traditional management literature does not address telecommuting directly.

How is managing telecommuters different from managing traditional employees?

NM: Traditionally, much of what managers evaluate tends to emphasize both inputs (attendance, tardiness) and outputs (performance quality and quantity). When managing telecommuters, they tend to shift their emphasis toward the evaluation of outputs. This shift is something new for many managers. Not surprisingly, managers, not telecommuters, have been the cause of stalled or failed corporate telecommuting efforts in several cases.



NANCY MELONE

IT'S A GROWING TREND.
IT'S TOO NEW FOR
CONVENTIONAL
WISDOM. AND IT'S
GOING TO AFFECT THE
WAY YOU DO BUSINESS.

What would you tell managers?

NM: Communication is key. Keep in mind that communication with telecommuters often involves less face-to-face contact and more voice mail, E-mail, and other forms of mediated communication. These can screen out important social cues that are useful in detecting misunderstandings or other problems that can influence productivity. Therefore frequent, precise communication (including listening) is essential.

Second, regardless of their status as telecommuters or resident employees, people who do the same work should be evaluated by the same standard.

What would you tell telecommuters?

NM: Telecommuting is not for everyone. Learning to telecommute effectively requires some accommodation: a quiet place to work, functional and dependable equipment, regular communication with your manager, and self-discipline. You should also consider how your relationship might change with coworkers who do not telecommute. Some people have found that they really need and miss the social interaction of the workplace. Many telecommuters have found it useful to have a telecommuting partner who is in the office on telecommuting days. This partner can be a tremendous help in getting things done.

Has telecommuting changed over the years?

NM: Motives driving many telecommuting programs in the 1970s and 1980s were environmental and in some sense philosophical. Motivating concerns included improving the quality of life, reducing energy consumption, and lessening pollution. In the 1990s, economics have joined the list of motivations; telecommuting lowers costs and improves productivity-two important considerations in today's globally competitive world economy.

How about telecommuting in the Northwest?

NM: The state of Oregon has encouraged telecommuting by such measures as the Business Energy Tax Credit. Oregon businesses that encourage telecommuting can also qualify for low-interest loans through the state's Small-Scale Energy Loan Program. In general, high-technology and information-based firms tend to find telecommuting attractive, and in the Northwest we have a strong high-tech base.

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The Brain behind the Backbone



DAVE MEYER

. One of the four computer screens aglow on Dave Meyer's desktop flickers with a live video image of the earth, mostly blue with a splash of white clouds, turning slowly a hundred miles beneath the space shuttle's wing. The technology that brings this image over the Internet was a blue-sky dream only ten years ago; now, it's what Meyer-the architect and builder of Oregon's high-speed, high-bandwidth, fiber-optic computer network-deals with every day.

. The Network for Engineering and Research in Oregon (NERO), originally funded by NASA and in operation since

1994, is capable of carrying vast amounts of data at lightning speeds both within Oregon and, by connecting to major Internet "backbones," around the globe. If most Internet connections carry a stream of data, NERO carries a river.

. Currently, NERO's function is twofold: first, to facilitate collaborative research and teaching among the engineering and computer science faculties of Oregon's major public universities, and second, to enable academia to carry on network-based collaborations with high-technology firms, and with such information-dependent industries as producers of software and computers. Intel, Hewlett-Packard, and Tektronix are all using NERO.

. "The industrial as well as the academic world is increasingly oriented toward digital information transfer and we need to keep up," states Meyer, director of the Advanced Network Technology Center on the University of Oregon campus. "The Internet is expanding at a phenomenal rate of 1,000 percent per year. It is absolutely vital that Oregon's industries, students, and academic researchers are equipped for future success by having access to the kind of first-rate networking that NERO delivers."

THE FIBER-OPTIC **NERO**
NETWORK HARDWIRES
SUCCESS FOR OREGON'S
INDUSTRIES, STUDENTS,
AND ACADEMIC
RESEARCHERS

. For the uninitiated, the network's technology-an acronym-strewn jumble of routers and relays, FIFO buffers, and clock-synthesis functions-gets very confusing very quickly. However, one comparison makes clear the magnitude of NERO's capabilities even for the techno-novice. While most of the Internet operates at a rate of 1.5 megabits of digital information per second, the NERO upgrade Meyer is developing will handle *45 megabits per second*. He calls this "world-class connectivity."

. How is the system being used? In dozens of ways-live video teleconferencing, developing and testing next-generation multimedia workstations, experiments in distance education. NERO has even allowed groups of scientists from various Northwest universities to join together electronically-forming "virtual" academic communities that seek out, and win, federal support for specialized research. When connected by so powerful a link as NERO, there is little difference between being located next door to a collaborating colleague or being in the next state.

. In coming years, expanded access to NERO is planned for Oregon's K-12 schools, communities, small businesses, and the community college system.

. "The world is changing very fast in the field of telecommunications," Meyer explains. "In the next few years many dramatic opportunities will be opening up, ones we haven't even imagined at this time. NERO will give some of Oregon's most creative people an incredibly powerful tool to wield. It should be a lot of fun."

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Schoolyard Prophet

. "The institutions entrusted with educating America's young children are goofing up on a monumental scale," fumes UO professor of education Siegfried "Zig" Engelmann. "They are chasing every trendy idea that comes along-and spending billions to do so-while test scores plummet and our kids are getting a lousy education." Engelmann has what he and many others consider a better idea, a no-nonsense teaching method he has developed over three decades.

. In an age when it is not uncommon to read newspaper accounts of illiterates being granted high school diplomas, Engelmann's approach, known as Direct Instruction, promises, and has delivered, remarkable results.

. "Kids taught in a fully implemented Direct Instruction program read by the end of kindergarten," he says flatly. "That's all kids-even disadvantaged kids, ghetto kids, and special-ed kids."

. How does Direct Instruction achieve such startling results? In sharp contrast to the vast majority of today's programs and theories for elementary education, Direct Instruction places responsibility for student success squarely on the teacher, according to Engelmann. In short, if the learner hasn't learned, the teacher hasn't taught.

**A ZEALOUS EDUCATOR'S
INNOVATIVE TEACHING
METHOD PROMISES
REMARKABLE RESULTS.
AND IT DELIVERS.**

and rerefined the best approaches.

. The result of this work is a method of fast-paced exchanges between teacher and pupils in which a



SIEGFRIED ENGELMAN

. "We don't blame kids or say they are not ready," he explains. "Any kid can be taught if the material is presented in the right way."

. Engelmann calls teaching a "technical business" and treats educating children as a reproducible science, not an inexplicable art. In developing Direct Instruction, he experimented with various techniques, meticulously measured success rates, discarded those that didn't work, and refined

child's misunderstanding or mistake is discovered and corrected immediately. Since children learn in a predictable manner, problems can be anticipated and a teacher's presentation scripted for maximum effectiveness.

. Typical of the results achieved with Direct Instruction are those seen at Wesley Elementary, a poor urban school in Houston, Texas. After receiving Direct Instruction, Wesley's formerly underachieving fifth graders were reading Shakespeare's *Macbeth* and outperforming students from better-funded suburban schools on standardized tests.

. In October of 1995, ABC's "20/20" featured Engelmann and Direct Instruction, contrasting it with the widely used "whole-language method." While disparaging the whole-language method, the report found Direct Instruction "impressive" and described it as "a simple solution that is being ignored."

. The obvious puzzle is how the educational establishment could fail to embrace a method that sends fewer kids into special-education classes, more into gifted classes, and a disproportionately high number to college. In his 1992 book, *War against the Schools' Academic Child Abuse*, Engelmann accuses school administrators of "raging academic incompetence" as they ignore this proven method while continuing to champion programs that, year after year, fail to produce desired results.

. The lack of acceptance of his method has caused him enormous frustration. Engelmann admits that a few years back he was tempted to give up the fight for Direct Instruction.

. "But the stakes were too high to quit," he says. "We are talking about the quality of life of millions of today's students, who are tomorrow's adults. It is a fight worth fighting."

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From the Lab to the Marketplace



LYNNOR STEVENSON

. The next time you quench your thirst with a sip of Gatorade, consider this: some of what you paid for the drink is supporting research at Florida State University. That's because FSU scientists developed the sports drink's formula.

University officials then licensed the formula to a private-sector company that marketed the product with stunning success. Gatorade is the jewel in the crown of Florida State's technology-transfer effort that, in 1994, brought the university a cool and refreshing \$6.7 million in royalties. For FSU, the tastiest news of all is that, as if from a bottomless bottle of Gatorade, the money flows in year after year.

. The UO has its eyes on the same prize and is working to commercialize products ranging from biosensors to computer-memory devices.

. "Some businesses have realized that there is money to be made by turning advances made in university laboratories into products for the marketplace," says Lynnor Stevenson, director of technology transfer at the University of Oregon.

"And, in these days of tightening federal support, universities

know that such partnerships can generate much-needed funding for research programs."

. Stevenson says the UO has a simple strategy for encouraging and supporting technology transfer. "After we identify promising research," she explains, "we bring in investors or corporate partners-sometimes early on, while the technology is still being developed. This support allows the technology to mature. When the time is right, we shepherd the invention through the paperwork process required to obtain patent protection. Then we either offer to license the patent to an existing company or to a spinoff company for further product development."

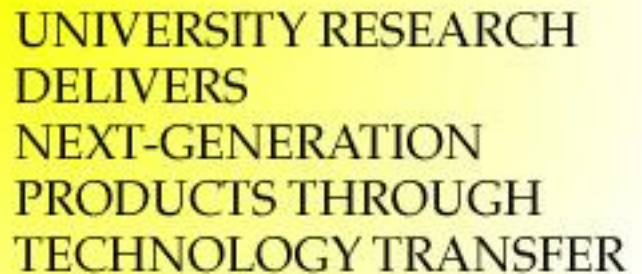
. Recently, most technology-transfer efforts at the UO have followed the spinoff path. Advanced MicROBOTICS, for example, is a high-tech start-up that uses the research findings of two university professors in developing miniature chemical- and biosensors.

. "These small start-up companies add value to the product, often making it attractive to larger companies," says Stevenson who-in addition to having a Ph.D. in biochemistry-is CEO of Cascade Oncogenics, a biotech firm.

. Technology transfer at the UO has three main objectives, she explains. "We want to get new inventions into commercial use so the public and participating companies benefit. We want university research to get additional funding and, therefore, to have additional opportunities. And we want to give preference to economic development in Oregon. Working with Oregon firms has the added advantages, beyond royalties and research funding, of employing University of Oregon graduates and other Oregonians as well as pumping more money into the state's economy," she says.

. How much money? Nationwide, forty-one universities brought in \$1 million or more from technology transfer in 1994. One hundred and twenty institutions brought in a combined \$265 million. One top research school, Stanford, earned \$38 million.

. The University of Oregon is a relative newcomer to these kinds of partnership opportunities, having formally begun its technology-transfer efforts in 1989. Nevertheless, the UO already holds about sixty patents, including five added last year. In 1995 the products generated about \$90,000. Obviously these revenues are not comparable to those generated by Gatorade, but, Lynnor Stevenson points out, "we're working hard to change that."



UNIVERSITY RESEARCH
DELIVERS
NEXT-GENERATION
PRODUCTS THROUGH
TECHNOLOGY TRANSFER

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Research Park Supports University-Business Collaborations

. The Riverfront Research Park includes this 60,000-square-foot building and the nearby Innovation Center, which provides low-cost for emerging high-tech companies. Current tenants do business in the areas of artificial intelligence, biotechnology, neuroscience, educational and entertainment software, and software engineering. Located on a 67-acre parcel along the Willamette River, the park is only a short walk from the University of Oregon and from downtown Eugene.



RIVERFRONT RESEARCH PARK

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