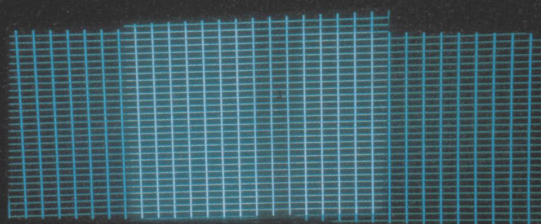
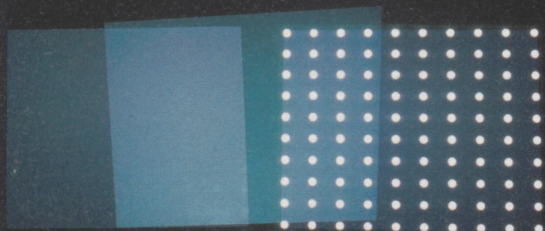
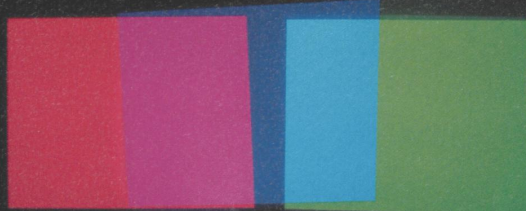
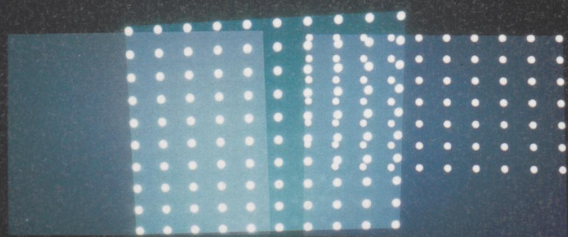


THE MAGAZINE OF UNIVERSITY OF KENTUCKY RESEARCH • FALL 2001

ODYSSEY



THE
METAVVERSE
PROJECTING US INTO THE FUTURE

The Magazine of University of Kentucky Research

ODYSSEY

FALL 2001

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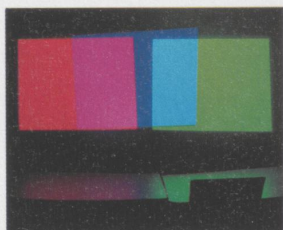
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The cover features various stages of the auto-calibration program developed at UK to blend the output of several projectors into one seamless, high-resolution image. Calibration begins with a series of dots that define the area of the image each projector is contributing and ends with a grid pattern that reflects the blended image. For more on this and related computer science research see "The Metaverse" on page 4.

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Published twice a year by the Office of the Vice President for Research, ODYSSEY seeks to inform, educate and entertain you on your journey through some of the cutting-edge research and innovative graduate programs that are part of the University of Kentucky's \$200-million-a-year research enterprise.

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Lee T. Todd Jr. UK's 11th President

Lee T. Todd Jr.

- Earned his B.S. in electrical engineering from UK in 1968 and M.S. and Ph.D. degrees in electrical engineering from the Massachusetts Institute of Technology in 1970 and 1973
- Received six U.S. patents in the area of high-resolution display technology while at MIT
- Taught, did research, published numerous articles, and won several teaching awards, including the UK Alumni Association Great Teacher Award, while a UK professor of electrical engineering (1974-1983)
- Co-founded the Kentucky Science and Technology Corporation (KSTC) in 1987; KSTC is a not-for-profit organization focused on increasing university research capacity, developing science and technology education (K-12) programs, and encouraging an entrepreneurial economy in Kentucky
- Co-chaired the PRISM (Partnerships for Reform Initiatives in Science and Math) Project in 1990 with former Education Commissioner Thomas Boysen, a project that emerged as the major math and science initiative of KERA
- Served on the Council on Postsecondary Education, and chaired the Distance Learning Advisory Committee responsible for the development of the Kentucky Commonwealth Virtual University and the Commonwealth Virtual Library
- Became senior vice president of Lotus Development in May 2000, responsible for Lotus products, including Notes, Domino and SmartSuite, and oversaw collaborative products such as Sametime and QuickPlace
- Began his term as UK's 11th president on July 1, 2001



"I started life in Hopkins County—Earlington, Kentucky—where an engineer was somebody who drove a train."

—Lee T. Todd Jr.

"We need to have a 'higher purpose' in our approach. It's taking the Kentucky uglies—the low literacy, poor health, low income—and having a higher purpose to say, 'Let's look at the things that have held Kentucky back and see how we can help.'"

—Lee T. Todd Jr.

RESEARCH

About Projectron

In 1981, Dr. Todd founded Projectron Inc. to manufacture projection cathode ray tubes (CRTs) for the flight simulation industry. The Projectron picture tube was used in approximately 90 percent of commercial flight simulators as well as numerous military simulators. In 1990, Projectron was sold to Hughes Aircraft Company. Dr. Todd convinced Hughes to move its other CRT operations in California and New York to Kentucky. He worked with the University of Kentucky and state government officials to start UK's Coldstream Research Campus with Hughes Display Products being the first tenant.

About DataBeam

Dr. Todd incorporated DataBeam in 1976, but major financing and product development did not occur until 1983. Located in Lexington, Kentucky, DataBeam developed large-screen, high-resolution displays where images of documents could be transmitted to multiple sites so that people can view them and work on them together as if meeting in person. The company makes conferencing and distance-learning servers based on the T.120 data communication standard that allows users to share data and applications online. DataBeam, which was sold to IBM in 1998, currently employs 100 people in Lexington. The vast majority of the technical staff are UK engineering and computer science graduates.



Dr. and Mrs. Todd talk to (left) Tim Robinson, Student Government president; Caroline Harralson, Student Government vice president; and Rashada Alexander, president of the Black Graduate and Professional Students Association.

W R I T T E N B Y
A L I C I A P . G R E G O R Y

A forest fire rages and UK mechanical engineer Jim McDonough is right in the thick of it.

But his skin doesn't feel the flames and his lungs aren't choked by the smoke—this is a “virtual” fire. He's surrounded by a life-size image of the blaze, projected on the walls of an ordinary room. As he is “immersed” by the fire, he observes how it moves and discovers how to control it.

While this may seem a bit like science fiction, and in fact that's where the concept came from, this new “virtual reality” is science fact. First described in Neil Stephenson's 1992 sci-fi novel *Snow Crash*, the Metaverse is a digital world that mimics reality and a term that captures the sense and spirit of innovative projects in networking, multimedia and computer vision under way in the Laboratory for Advanced Networking (LAN) in the James F. Hardyman Building at the University of Kentucky.

“The collaborations going on here among computer science and electrical engineering faculty and students are best described by the term ‘Metaverse,’ which is the over-arch-

ing theme that ties all of our research interests together,” says Jim Griffioen, LAN director.

To faculty tackling research in areas such as network protocols, distributed computing systems, and visualization, the meaning of the Metaverse can be boiled down to two words: networked multimedia. “People enter these virtual worlds with pixels [image building blocks] painted all around them, and we need to provide the communication infrastructure so you can effectively interact with other people in similar environments, just as if they were sitting right across from you,” says Griffioen.

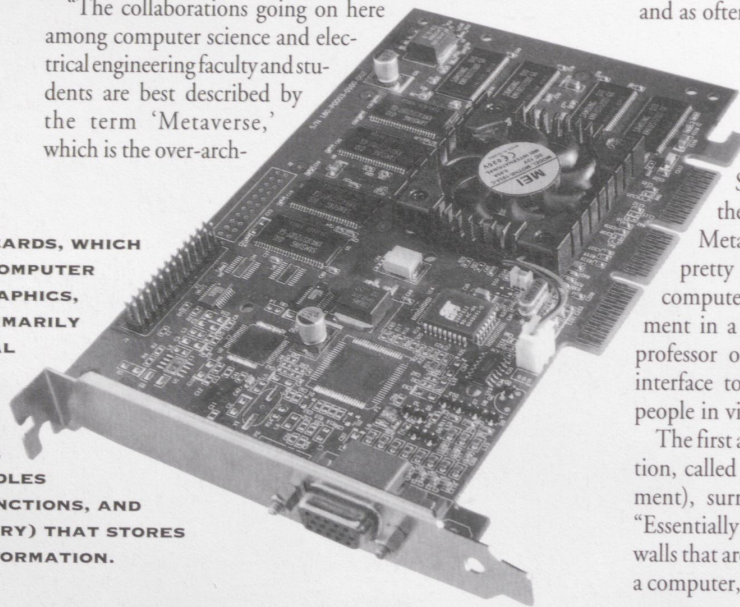
With applications ranging from teleconferencing, scientific modeling, virtual art exhibits, digital library collections, and personal computing, the Metaverse will do nothing less than change the way we see, play, learn, and work. One day each of us may enter the Metaverse as easily and as often as we now tap into the Internet.

Pixel Immersion

Application-level research at UK focused on this pixel-painted world (a.k.a. immersive display environment) is spearheaded by Brent Seales and Christopher Jaynes, and funded by the National Science Foundation. “I think of the Metaverse as creating a world for our senses that's pretty seamless in terms of integrating real video, computer models, and your reaction to the environment in a very natural way,” says Seales, an associate professor of computer science. “The Metaverse is an interface to interact with the way we represent other people in video, as well as with 3-D models.”

The first and still prevalent paradigm for such visualization, called a CAVE (Cave Automatic Virtual Environment), surrounds the user with rear-projection TVs. “Essentially you walk into a room that consists of four walls that are just gigantic back-projection TVs hooked to a computer,” Griffioen explains. “This technology is very

GRAPHICS CARDS, WHICH HELP THE COMPUTER DISPLAY GRAPHICS, CONSIST PRIMARILY OF A SPECIAL PROCESSOR CALLED THE ACCELERATOR, WHICH HANDLES DISPLAY FUNCTIONS, AND RAM (MEMORY) THAT STORES DISPLAY INFORMATION.



THE METAVERSE

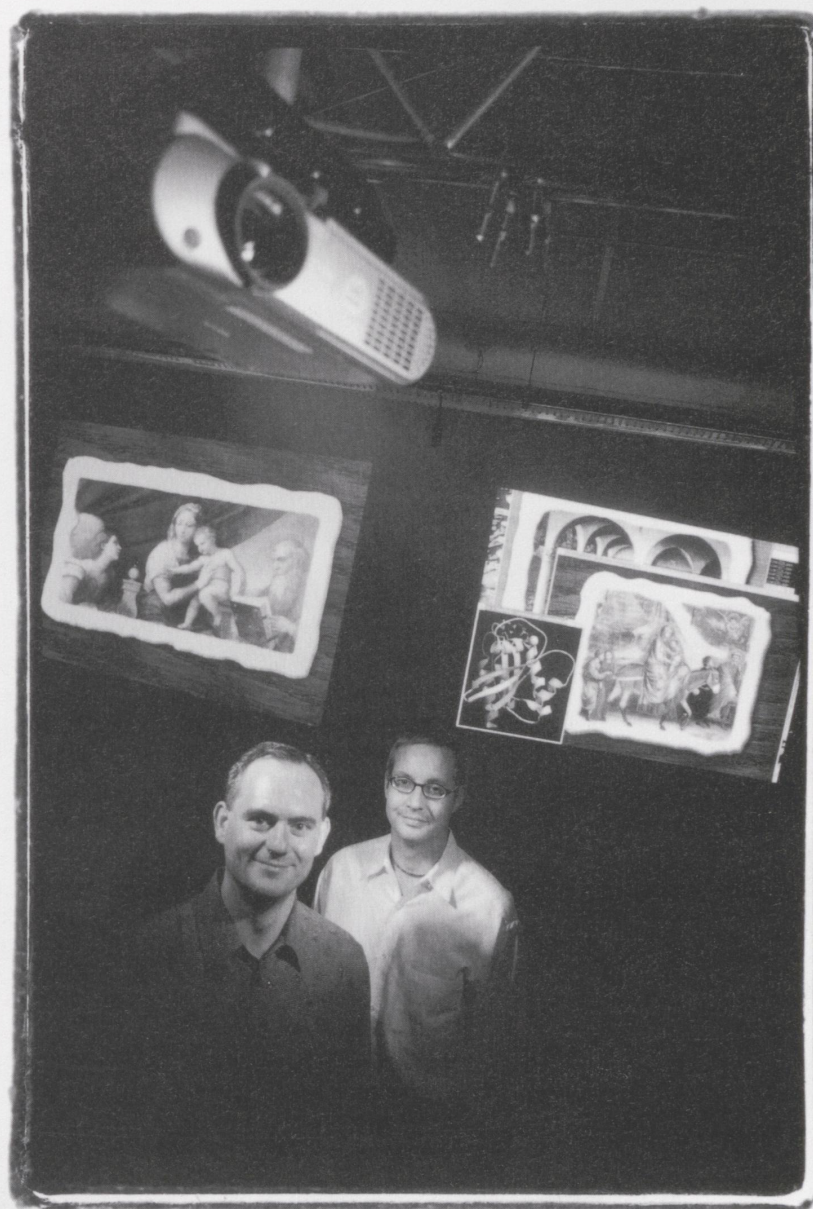
PROJECTING US INTO THE FUTURE

useful for scientific visualization. It allows users to get into their data and look around." But the big drawback is money. "Back-projection is incredibly expensive and immobile. You have to do a lot of renovation to your space," Griffioen says. "And more importantly, CAVEs are hard to maintain. If these TVs get out of sync or stop working, it's a massive undertaking to get them fixed."

The solution: a new paradigm featuring low-cost, self-configuring visualization environments that are networked together and can be set up, practically on-the-fly, at any location. Seales and Jaynes describe several types of Metaverse "portals"—a room where all four walls are covered with projected images, a classroom where the front wall is a gigantic projected display, or a trade-show kiosk where images are being projected on temporary screens. But all of these options rely on the same relatively inexpensive technology—video projectors, graphics and network cards, and off-the-shelf PCs.

"Three years ago this projector cost \$8,000," says Seales, pointing to the projector mounted above the desk in his office. "Right now you can get a high-end projector with the same capabilities for \$3,500. You can get a good projector for \$2,000, and the price just keeps dropping."

And thanks to game technology, the graphics cards needed to run the Metaverse environment cost only \$200. "You can think about the graphics card as actually being a computer in the form of a card," says Seales. "We've harnessed the capabilities of those cards to do the computations to make the display look seamless. Because the market is driven by all those teenagers buying games, we can now buy the latest and greatest card for \$200 and do stuff with it that five years ago you couldn't do without a complete workstation. So with a PC (plus graphics card and network card) per projector, network communication, and



BRENT SEALES (LEFT) AND CHRISTOPHER JAYNES ARE LEADING RESEARCH INTO THE APPLICATIONS OF FRONT-PROJECTION TECHNOLOGY FOR IMMERSIVE VIEWING EXPERIENCES.

continued on page 6

"I think of the Metaverse as creating a world for our senses that's pretty seamless in terms of integrating real video, computer models, and your reaction to the environment in a very natural way."

—Brent Seales

THIS SEQUENCE OF PHOTOS OF AN AQUARIUM SIMULATION (WITH SWIMMING WHALES AND SHARKS) ILLUSTRATES THE AUTO-CALIBRATION PROGRAM DEVELOPED AT UK. A) THREE PROJECTORS ARE COMBINED TO PRODUCE A SINGLE DISPLAY. B) MICHAEL BROWN CHANGES THE POSITION OF THE MIDDLE PROJECTOR. C) BECAUSE THE PROJECTOR HAS BEEN TILTED, THERE ARE NOW "GHOSTS"—YOU SEE DUPLICATE FISH AS THEY CROSS INTO THE AREA PROJECTED BY THE MIDDLE PROJECTOR. D) THE CAMERA WATCHING THE DISPLAY RECOGNIZES A PROJECTOR HAS MOVED, AND THE COMPUTER BEGINS A RECALIBRATION SEQUENCE. THE SEQUENCE BEGINS WITH A SERIES OF DOTS THAT DEFINE THE AREA OF THE IMAGE EACH PROJECTOR IS CONTRIBUTING, AND ENDS WITH THIS GRID PATTERN THAT BLENDS THE THREE PROJECTIONS TOGETHER. E) THE NEW, FIXED IMAGE SHOWS THE FISH SWIMMING ACROSS THE SEAMLESS DISPLAY.

some clever algorithms, you can launch the Metaverse."

But Seales and Jaynes didn't stop there. They added a camera that tracks the user. "The idea is that we'll have a virtual interface in the Metaverse. There won't be a keyboard or mouse anymore. I will convert my office into an 'intelligent' display where cameras will be watching what I'm doing. Say, today's newspaper is being projected on the surface of my desk. If I make the motion of turning a page, I should see the image change, just as if I were turning the page of an actual paper," says Jaynes, a computer science assistant professor. He labels this work "augmented reality" and while it may sound a little "out there," it would mean direct interaction with the Metaverse environment. For example, a professor using a projected display for a lecture could advance his PowerPoint presentation by "pushing" a virtual button.

Seales and Jaynes are testing these concepts in the CoRE (Collaborative Rendering Environment) lab in the Hardymon Building. This immersive display lab is currently stocked with six high-resolution projectors, six PCs with graphics cards, two infrared tracking devices, a network hub and six network cards, four cameras, and a wireless keyboard and mouse.

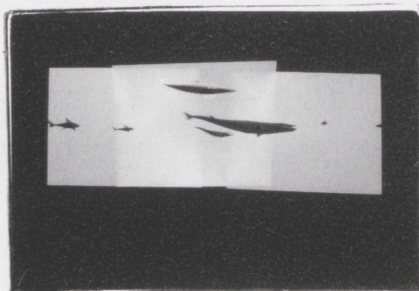
"Our goal in the CoRE lab is to have a projector covering every surface," Jaynes says. "We plan to hang at least 15 projectors from the ceiling."

More projectors mean higher resolutions. "Right now we can get about 10 megapixels up on the wall for you, which is about twice as many as a CAVE can do. But there's no reason, in this framework, that we can't scale that up to 100 or 1,000 megapixels, which equals a giga-pixel," says Seales.

The question of how you can blend the output of many projectors into one image is where Seales's and Jaynes's training in computer vision (understanding how a computer processes visual information) comes in. Seales earned his master's and Ph.D. from the University of Wisconsin-Madison, and wrote his thesis on machine vision. During a leave of absence from UK, he spent the 1991-92 academic year as a postdoctoral scholar at INRIA, the French National Institute for Research in Computer Science and Control.

Jaynes's interest in computer vision started in high school at a job with Hewlett-Packard. "I worked with a robot they were trying to use to deliver mail automatically," he says. Jaynes went on to undergraduate study at the University of Utah, a school well known in the computer vision and graphics field, and to graduate school at the University of Massachusetts.

"I have to say that when I came, UK was not really poised to be a player in what I was interested in doing," says Seales. "But through a number of grants, and initiatives from UK and outside the university, like



A



B

UK's magazine on research

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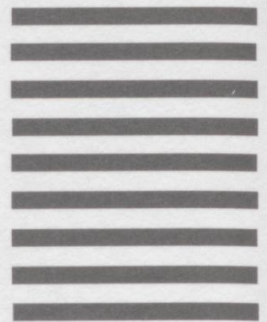
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the Research Challenge Trust Fund, UK is now a player."

"When I graduated from UMass in late 1998, I wanted to go to a school with a lot of resources, but I wasn't interested in going somewhere that was already famous for computer vision," Jaynes says. "I wanted to go to an up-and-coming school where I could set my own research agenda." The problem with going to a well-known program, says Jaynes, is that young faculty often end up working under a "star" as a second-tier researcher, sometimes forever.

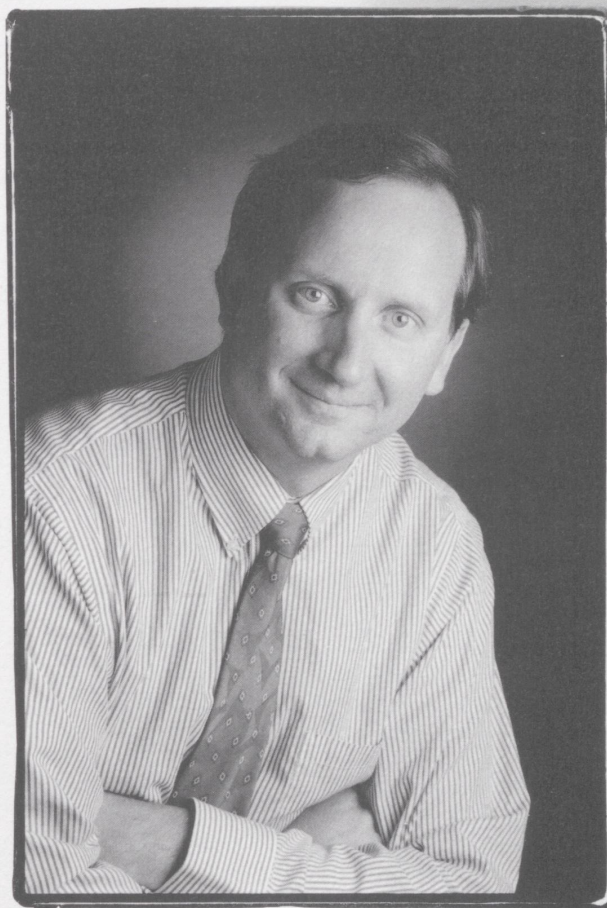
"I wanted to do exactly what we're doing now—define a difficult problem, like the Metaverse, something a little bit 'out there,' and work together to come up with solutions so we can actually reach something exciting."

The Fundamentals and the Future

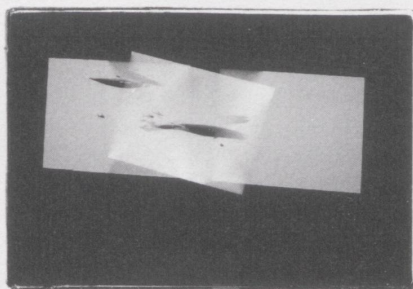
At any given time, Seales and Jaynes have a team of 20 to 30 Ph.D., master's and undergraduate students working on Metaverse projects. In fact, Steve Webb, now a Ph.D. student and one of the first undergrads Jaynes recruited, was a key player, Jaynes says, in the Metaverse shadow-removal project.

Jaynes came to UK with the promise of prime real estate in the new Hardyman Building, but with completion still a few

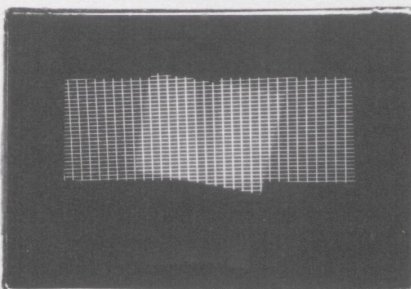
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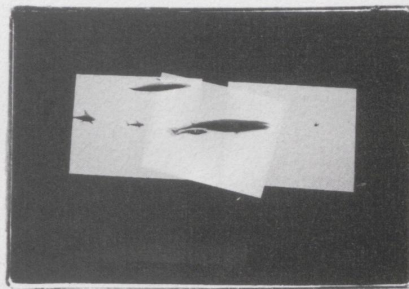
JIM GRIFFIOEN IS THE DIRECTOR OF THE UK LABORATORY FOR ADVANCED NETWORKING.



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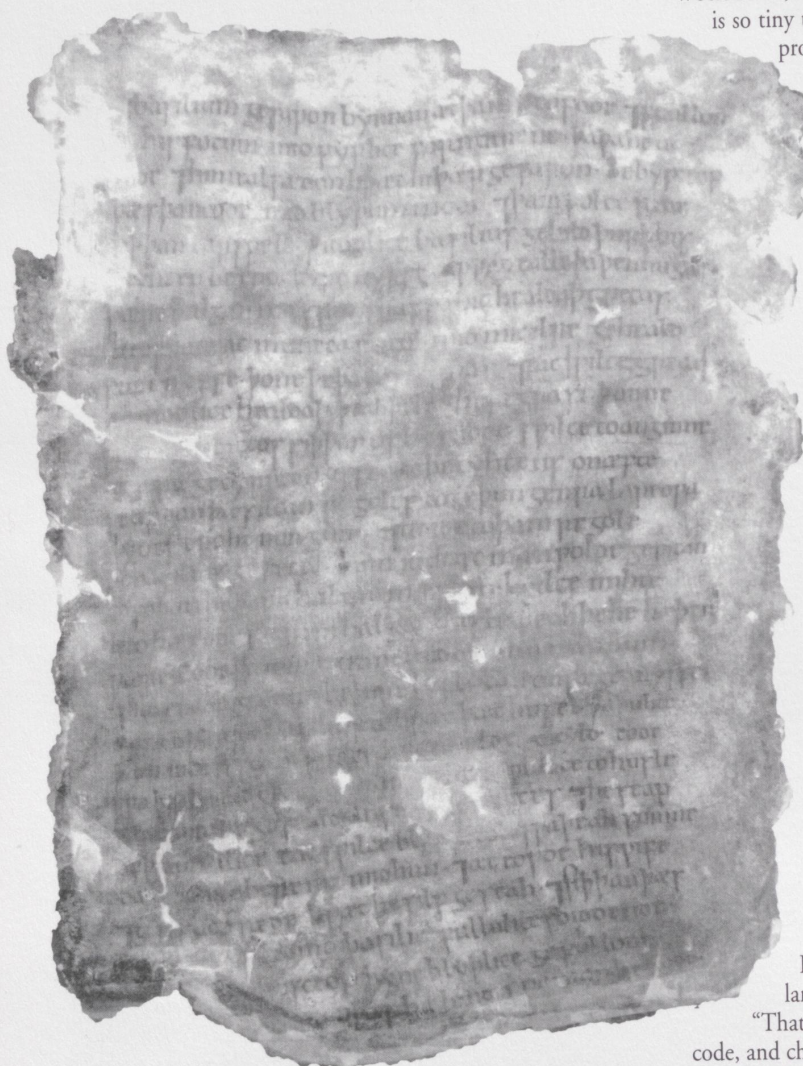
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"Say, today's newspaper is being
projected on the surface of my desk.
If I make the motion of turning a page,
I should see the image change, just as if
I were turning the page of an actual paper."

—Christopher Jaynes



**BRENT SEALES AND HIS RESEARCH
TEAM ARE USING DIGITAL TECHNIQUES
TO PRESERVE A SET OF FIRE-DAMAGED,
11TH-CENTURY MANUSCRIPTS.**

years away and no space to start the projection research he was interested in, he enlisted the help of Joe Fink, director of ASTeCC, the Advanced Science and Technology Commercialization Center. Fink arranged for Jaynes to use a third-floor office in the ASTeCC building.

"So Steve and I mount two projectors on the wall of this little office. We sit down, and the shadow-removal project was born because the room is so tiny that no matter where he sits Steve's head is blocking the projector," Jaynes recalls. "And Steve says, 'We should know where my shadow is on the wall and correct for it with the second projector.' It was a great idea.

"By providing us space, Joe helped kick-start this research," Jaynes says. "Without his help we wouldn't have had displays ready for opening day of the Hardyman Building last September."

The idea behind the project was to exploit projector overlap. "When you have double or triple illumination (every point illuminated by multiple projectors), you can remove a shadow because the camera detects when a projector is blocked and the computer makes the other projectors kick-in more light," says Seales. The computer creates a mask, which defines the area of the image that is being obscured, and tells the other projectors to blast in those missing pixels to complete the image.

The technical paper on shadow removal, authored by Jaynes, Webb, Seales, and Michael Brown, one of Seales's Ph.D. students, will be published as part of the IEEE (Institute of Electrical and Electronics Engineers) Visualization 2001 conference in San Diego this fall.

"My research philosophy has always been: approach things theoretically, understand the mathematics, and solve the problem. But then there's always an extra step—figure out how you can make it work in hardware for low cost," Jaynes says. "Our shadow-removal tool runs in hardware at a rate of 30 frames per second—you can wave your arm and it automatically corrects. And it runs on hardware that anyone can afford; in fact, your home PC will probably run it."

Provided you are running Linux. An alternative to Windows or Mac created by University of Helsinki student Linus Torvalds in 1991, Linux is an operating system popular among computer scientists because it is "open source."

"That means I can go into the operating system, look at the source code, and change it to make it behave how I need it to behave," Jaynes says. "And when you're talking about research, no one is doing the same things we are, so we have to be able to tweak the operating system."

Serious Play

Writing the algorithms to run the Metaverse involves some serious math smarts. "Computer vision's a total mixed bag. There are very theoretical components, there's deep mathematics, and you have to be able to do those two things plus write really good code to make the stuff work in the end. If someone comes to me and they know a little bit about linear algebra, I say they can usually pick up the projective geometry stuff. People say my lab is too hard and some students avoid me," Jaynes says, smiling. "But I have outstanding students right now."

"Our students recently set up a four-projector display, 11 by 11 feet, and they're running Quake [a popular arena combat game] on top of our software that blends it all together into one huge image," Jaynes says. "What's good about that is it proves our system actually works with out-of-the-box software."

Michael Brown implemented the Quake system. "This combination of self-configuration and OpenGL [a graphics language] portability is one of the major themes in Michael's thesis work," says Seales. Brown earned his Ph.D. from UK in July and accepted an assistant professorship at the Hong Kong University of Science and Technology.

The "synchronized rendering algorithm"—the mathematical magic behind transforming the output of several projectors into a seamless image—works in a pretty simple way, as Jaynes explains.

"Each projector says, 'It's my turn to draw the picture. I'm ready to draw it.' They send that message over the network, and when every projector is ready, the server says, 'Draw.' Just last week my students got about 10 e-mails asking to download our algorithm for Linux. These are probably just kids that want to do the Quake thing, but word is starting to leak out."

UK recently received three significant grants from the National Science Foundation to support the next generation of the Metaverse.

- \$1.27 million grant to fund infrastructure development and research into techniques to support three physically separate, networked visualization laboratories and two new technical staff
- \$1 million grant partners UK, the University of Puerto Rico and Museo de Arte de Puerto Rico to fund research into acquisition, representation and display of digital collections
- \$375,000 grant to fund further research into configurable display systems for digital libraries and museums

Jaynes is pursuing intellectual property protection, which may ultimately lead to patents, for a number of ideas, including shadow removal, auto-keystoning, and auto-calibration.

If you tilt a projector up, the sides of the image are no longer parallel and form a shape that resembles a keystone in an arch. Matt Steel, a Ph.D. student working with Jaynes, is writing algorithms to automatically fix this problem, even as you reposition the projector. "The university could benefit by patenting these ideas for use in the home-theater market," Jaynes says. "I think eventually we're going to have a projector company in here wanting to make a new product, a projector with a built-in camera. You set it on a table, hit a button, and it starts to monitor things like shadows and changes in lighting."

As projector size and price decrease, Seales says he envisions projectors as next-generation track lighting. "I think people are going to pepper rooms with projectors just like normal lighting, only it will be lighting that's completely controllable by computer," he says. But before that happens, this technology will most likely eliminate the traditional desktop monitor. Seales and Jaynes are already using projectors instead of monitors in their offices. They can project their "screen" on any wall at much higher resolutions than most monitors, freeing-up desktop space, and with a wireless keyboard and mouse, they're not constrained by cords.

On a larger scale, Seales envisions libraries setting aside a room where users can view digital collections through the Metaverse. "Imagine if you went to an art museum and you had to look at each piece of art through a two-inch hole," Seales says. "Essentially that's what the digital library is now—what you see is limited by the size and resolution of the monitor. We want each library to have an immersive archive room where you can see the artifact at high-resolution. These rooms would be networked so that you'll be able to see collections from other libraries at the same time as you look at local collections."

One of Seales's current projects involves digitally capturing a set of manuscripts written by an 11th-century monk on the lives of the saints, part of the British Library's Cottonian Collection which was damaged by fire in the 18th century. (This work is part of the Digital Atheneum project at UK and supported by NSF.) "Dr. Kevin Kiernan [UK English professor] provides the scholarship for the humanities side of the project, while my team and I provide the technical innovation," Seales says. "Because of the damage, these documents are inaccessible to scholars, unless they travel to the British Library. Once we work on ways to digitize the manuscripts, the Metaverse would allow scholars all over the world to explore these works."

continued on page 11

University of Puerto Rico Students Spend Summer in Lexington

"It's so quiet here." That seemed to be the consensus of the University of Puerto Rico (UPR) students who spent eight weeks at UK this summer. And compared with their capital city San Juan, with a population of 1.6 million, Lexington, Kentucky, would seem pretty tranquil. But against this backdrop of relative quiet, computer science majors Jesus Cabán, Maria Merghal and José Ortiz Ubarri managed to squeeze a lot of cutting-edge research into two months' time at the Laboratory for Advanced Networking.

The UK-UPR connection goes back to 1998 when eight Puerto Rican students came to Lexington for a summer research program.

This year 10 students from UPR came to UK, five in computer science and five in toxicology and biomedical sciences. UPR has 70,000 undergraduate students on 11 campuses, including the High-Performance Computing Facility and medical center, and has some unique resources such as a primate center and tropical forestry institute.

Ashley Netherton, the first UK student to travel to UPR, is currently gathering data for her master's work in tropical reforestation at a geostation in the only tropical rain forest in North America. A number of UK faculty have spent sabbaticals in Puerto Rico and have taught short-courses there, including Brent Seales and Christopher Jaynes. In fact, that's how they met these students.

Seales taught the three students during his short course, "Introduction to Image Processing," at UPR last January. "Jesus, Maria and José are really bright," Seales says. "I saw the students who were really motivated and then had some influence in encouraging them to come up."

Cabán, who worked closely with Seales during his time at UK, concentrated on the fundamental set-up of the Metaverse. "I focused on a project that distributes the rendering [drawing] of the graphics between any number of machines," Jesus says. He spent

time writing programs to do things like calibrate projectors for the Linux operating system, based on programs UK students had originally written for Windows NT. Cabán works at the High-Performance Computing Facility in San Juan, which serves researchers all across Puerto Rico, and interned at Silicon Graphics in Orlando, Florida, last summer.

Cabán and Seales spent several days in July setting up the first Metaverse node in Puerto Rico at the computing facility. "Getting Jesus involved is a major coup because he'll have a whole year to give us weekly reports on how it's going, and as

we have new technology to deploy, he can help set it up," Seales says. "Conveniently, Jesus's brother William Cabán is in charge of setting up Internet2 at the center, so we have an 'in' as far as getting the network bandwidth we want as soon as possible."

There will be two Metaverse nodes in Puerto Rico, one in the computing facility and one in the library. "They'll have a local-area network to connect

the two sites, just like we'll have at UK, and then we'll have the wide-area connection so students in Puerto Rico could watch Jim McDonough teach from our mechanical engineering building," Seales says. Jaynes plans to take his UK students to Puerto Rico in December to set up the node in the library.

Merghal took Jaynes's one-week seminar in Puerto Rico on OpenGL, and says that's why she came to UK.

"OpenGL is a graphics programming language that is capable of exploiting the accelerated graphics hardware in most PCs today," Jaynes says. Merghal used this language to make an interactive 3-D model of the James F. Hardymon Building.

"OpenGL is the most basic way of creating graphics; there's no visual interface where you click with the mouse. It's just code



UNIVERSITY OF PUERTO RICO COMPUTER SCIENCE STUDENTS (LEFT TO RIGHT) JOSÉ ORTIZ UBARRI, JESUS CABÁN, LUIS VÉLEZ MATEO, MARIA MERGHAL, AND NATHANIEL GONZALEZ SPENT TWO MONTHS AT UK THIS SUMMER.

that makes points and vertices," she says. Before she came to UK, Merghal was working on a 3-D model of the bell tower in San Juan. "We were experimenting with that, and we plan to move on to other historic monuments and buildings in Puerto Rico."

Ubarri, who also works at UPR's High Performance Computing Facility, conducted research under Jim Griffioen's direction. "I worked on the DigitalAtheneum project, which has a goal of enabling literary scholars to recover the content of old documents through image processing," says Ubarri, who after graduating from UPR plans to stay in academia as a networking researcher. "Scholars can exchange the methods in which they restore old documents with other scholars through a friendly graphical user interface," he says. "I worked on how that interface contacts servers over the network."

Cabán, Merghal and Ubarri all say they enjoyed their experience at UK, and it's good for the university as well, says Del Collins, associate vice president for research and graduate studies in the medical center. "The summer research experience program has been particularly productive because it's enabled us to bring students from another culture to conduct research at the University of Kentucky," says Collins, the key UK player in creating this program. "But it also has enabled us to recruit some high-quality Spanish-speaking students to do graduate study here, providing important diversity to the campus." ■

In a similar way, Seales and Jaynes see the art world embracing this technology. Imagine accessing a collection at the New York Metropolitan Museum of Art and viewing it on your wall at home. Doreen Maloney, an assistant professor in the UK College of Fine Arts is interested in using the Metaverse to make art more accessible. "Doreen and I have been meeting to devise a strategy to have the Metaverse CoRE Lab as a stop on next year's Gallery Hop," Jaynes says. "We'll have hors d'oeuvres and people will be able to view her artwork on the walls. This would be really good for UK. It's a high-profile event, and it would bring the technology to the forefront."

Jim McDonough, who studies problems like airflow in coal mines and how forest fires spread, collaborated with Griffioen on a proposal to NSF based on the potential for the Metaverse in his research and teaching.

"Most of us who do computational fluid dynamics have recognized for years that as computing power permits us to solve increasingly more difficult problems, we'll need better ways to analyze and understand computed results, simply because we'll be getting more data from a simulation," says McDonough. "Just as we have moved from leafing through piles of computer paper output in the 1980s to flat-screen scientific visualization in the 1990s, we are confident that we must now move to fully immersive, interactive, 3-D methods to be able to understand what the results of a simulation are telling us. The Metaverse will provide such capability at a reasonable cost."

McDonough is also planning to use the Metaverse to teach an undergraduate course in basic fluid mechanics. "This is typically one of the more difficult areas for undergrads to comprehend, and most of us who teach it feel it would be valuable to provide laboratory demonstrations during lectures, possibly as part of every lecture. But this isn't

feasible; it's too expensive, too time consuming, and in some cases, even dangerous. We believe the Metaverse will provide us with a tool that will allow easy, inexpensive display of the same things that a laboratory experiment would give us." As part of the NSF proposal, Joan Mazur, UK College of Education, and her students will evaluate the effectiveness of teaching with the Metaverse.

The next step for Seales and Jaynes will be installing Metaverse portals around campus, including one in the new mechanical engineering building, where McDonough will teach, and the William T. Young Library. "I believe that five years from now we'll have people teaching classes in front of a big immersive display. It will use gesture recognition, so they can hit a virtual button on the screen to advance their PowerPoint, and that lecture will be broadcast through the Metaverse to our CoRE lab and to the library so others can participate. If, by the end of five years, people are requesting time to come in and use these immersive displays, I'll feel like we've been successful," Jaynes says.

Networking and New Faces

While UK is not the only university exploring immersive displays, the unique strength of the Metaverse and the UK LAN is that it brings together researchers working at all levels of networking, ranging from the multimedia applications that use the network to link projectors, cameras, and computers, to the network protocols used to carry the data.

"Our whole paradigm depends on at least a local-area network to make it work," says Seales. "If you want to go to the next level, where you're sending information back and forth to other Metaverse sites, you're looking at a wide-area network. I

continued on page 12

As one of the 11
programs that UK
targeted for Research
Challenge Trust Fund
money, Computer
Science and Electrical
Engineering hired
nine new faculty.

understand the data and algorithmic requirements, but the transport is beyond me, so it's absolutely critical that we're collaborating with network experts."

Griffioen credits unique collaboration between LAN researchers on the second floor of the Hardyman building and the UK network administrators on the first floor as vital to the future of the Metaverse. "Having the people who manage real networks so close by has been very beneficial," Griffioen says. "They are able to provide insight into problems we might encounter as we deploy these futuristic environments."

"Working with Doyle Friskney (associate vice president of information systems) and others in charge of UK's networking infrastructure gives us unique access to the campus network as an experimental network," Jaynes says, and points out that this kind of collaboration was one of the reasons he was drawn to UK. "I was looking for an environment that allows me to incubate ideas in the presence of other people, and the networking people here are very valuable to me in that step." And, like Jaynes,

many of those networking gurus were recruited to UK through the Research Challenge Trust Fund (RCTF).

The initial phase of RCTF, a program established by the 1997 Kentucky Postsecondary Education Act, included \$16 million to support new faculty, graduate students and staff. As one of the 11 programs that UK targeted for Research Challenge Trust Fund money, Computer Science and Electrical Engineering hired nine new faculty, including LAN members Ken Calvert, Christopher Jaynes and D. Manivannan, and affiliate members Alexander Dekhtyar, Hank Dietz, Zongming Fei, and Jane Hayes.

Pumping Up the Network

"The Metaverse introduces some very difficult networking problems," says Griffioen, a UK faculty member since 1991. "The amount of visual information generated by the Metaverse is massive, and even today's high-speed networks are largely incapable of delivering this type of data back and forth."

Griffioen earned his Ph.D. from Purdue University and spent time at AT&T Research Labs in New Jersey studying problems involved in delivering TV across the Internet. His focus is network protocol design (a protocol is the "language" a computer uses to communicate with other computers over a network). Griffioen works closely with Ken Calvert, who was recruited in 1998 from the Georgia Institute of Technology in Atlanta, and together they have grants from the Defense Advanced Research Projects Agency (DARPA), NSF, Intel, and Cisco. Calvert's expertise is in "active networking," a concept he sums up with the phrase "putting the 'work' in network."

He goes on to explain that the Internet relies on routers, the baggage handlers or mailmen of the network. Routers process each packet (each chunk of information)

by looking at the "zip code" and sending the packet out the appropriate line to its destination.

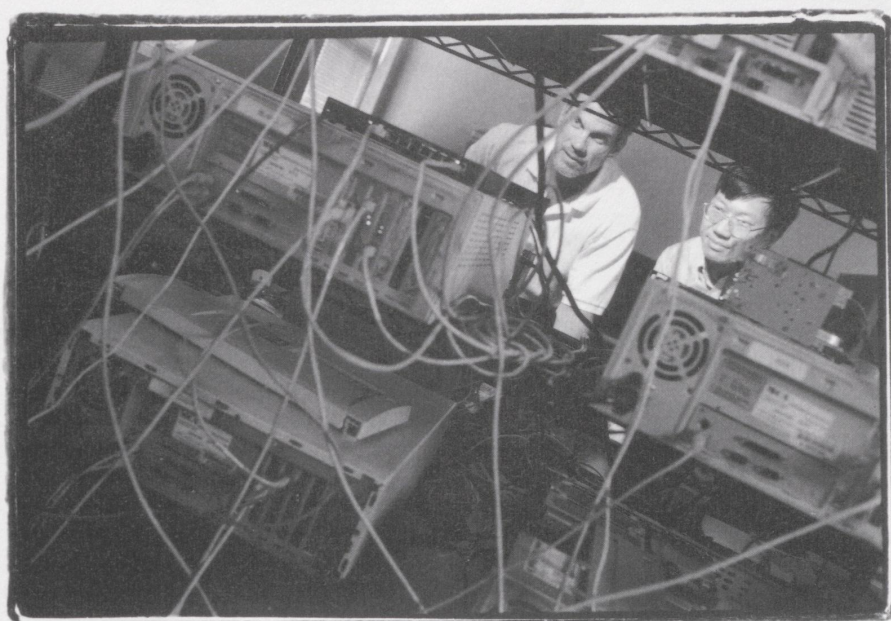
"I tell my students the reason we build networks is to share resources, but there's a whole infrastructure that exists simply to schlep bits from here to there," says Calvert, an associate professor of computer science who earned his master's at Stanford and his Ph.D. at the University of Texas-Austin.

"The idea of active networking is to strategically take advantage of the ever-decreasing cost of computers by putting additional capabilities in the network so it can do more than just move your bits." Calvert is among a growing group of engineers looking for capabilities to add to networks that will give, as he describes, "the biggest bang for the buck, while preserving the characteristics that made the Internet a success—simplicity and robustness, for example."

In 1997 Calvert and his Georgia Tech colleagues set out to write a game plan for active networking, backed by funds from DARPA, the group that wrote the early Internet protocols. What they came up with was an "architectural" document that spells out the different components of active networking. "When we started, a lot of people were going in different directions, using different vocabularies and assumptions," Calvert explains. "Our document defined a set of shared assumptions and defined the pieces of the system we were trying to build so people could point to it and say, 'That's the piece I'm working on.'"

The key components of an active network are the Node-OS (Node Operating System), a sort of software that controls access to the hardware and transmission channels, and Execution Environments (EEs), which interpret packets.

One of the research projects Griffioen and Calvert are tackling deals with injecting code into the network that merges video streams together, thereby reducing the total bandwidth required. "In this experiment we're



**KEN CALVERT (LEFT)
AND ZONGMING FEI
ARE INVOLVED IN
NETWORKING
RESEARCH TO
OPTIMIZE THE
COLLABORATIVE
POTENTIAL OF THE
METAVERSE.**

sending multiple video streams towards a receiver. As they encounter bottlenecks in the network, where they can't all squeeze through, we've put code inside the network that, on-the-fly, takes multiple streams and transcodes them into a single stream by discarding the least important data," Griffioen says. "This produces the best-quality video given the restraints."

The performance of the Internet and the Metaverse are Zongming Fei's primary research concern. Fei, who recently received his Ph.D. from Georgia Tech, came to UK as an assistant professor in 2000. His work centers around the problem of server location. "When you go to a Web page, say cisco.com, there's not just one machine out there that has all of those pages. That site's actually on machines scattered all over the place and the network figures out which one you should connect to," Griffioen says. Fei is looking at ways to determine which server will have the best response time, and

is even involved in strategies to help companies that are ready to install servers figure out where they'll get the best bandwidth.

"The ultimate goal of this research is shorter response times for clients. From the server perspective, if the load on servers is more evenly distributed, the service time will be reduced and everybody can work faster," Fei says. "I am designing a framework, or protocol, that clients can use to specify the requirements and a mechanism that can automatically locate the server with the best performance."

This work relates directly to the Metaverse, Fei says. For multiple Metaverse sites, you'll need multiple servers, he says, and at each site you'll need to locate a server that can provide the best performance for seamless graphics and real-time interaction.

How long will it take for the Metaverse to become pervasive?

Griffioen doesn't have a crystal ball, but

he says that once projectors fall into the price range of desktop monitors, we'll probably see large-scale use in personal computing. "Once you've worked in an immersive environment, you immediately start to see the benefits," he says. "When students come into your office to discuss their project with you, it's one thing for them to look over your shoulder at the monitor. It's a whole other thing for it to be as big as life on the wall where you can sit down and share the viewing experience."

As far as the network speed needed to run the Metaverse, Griffioen says it's coming. "Ten-gigabyte ethernet is right around the corner, so within just a few years' time we'll have much higher speed bandwidth available and that will facilitate the type of communication we'll need for the Metaverse. With prices of projectors dropping and network bandwidth increasing, the future is within reach." ■

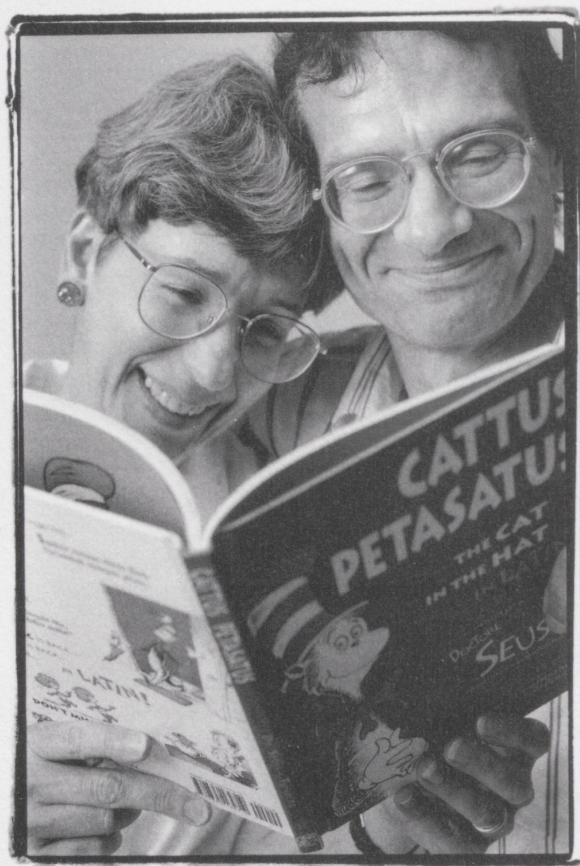
The Latin Dr. Seuss Is on the Loose

When Jennifer and Terence Tunberg, a husband-and-wife team who are Latin professors in UK's Department of Classical Languages and Literature, set out to translate a Dr. Seuss classic, they knew it wasn't going to be mere child's play.

"A lot of people don't realize that translation is not just word substitution, not a simple mechanical exercise," says Terence ("Terry," to friends and colleagues). "Translating poetry is a special challenge. It demands a lot from the translator—thorough knowledge of the target language, familiarity with classical form and meter, and a sense of the culture and history that infuse the language."

"Metaphors especially don't translate well," says Jennifer. "For example, the French have a term that translates literally 'my little cabbage,' which is an endearment in French but isn't particularly complimentary in English. We ran into all sorts of situations with Seuss's *Cat in the Hat* where our inventiveness was really put to the test."

The Tunbergs' challenge was to capture the flow and flavor of this children's book in rhyming Latin translation. To do this, they studied a wide range of Medieval Latin texts, including drinking songs, and found a meter to pattern their work after. "We went for patterned verse, as in the original," Terry says. "In the Middle Ages lots of poets started using end rhyme, and we found a Medieval meter that's used for some famous works. Medieval rhymes were framed in couplets, with rhyme in the last two



JENNIFER AND TERRY TUNBERG ENJOY THE SPECIAL CHALLENGES OF TRANSLATING DR. SEUSS INTO LATIN.

syllables of each line. So we appropriated this pattern."

Another challenge, Jennifer adds, is that Seuss was so imaginative and idiosyncratic in inventing new English words. Dr. Seuss, a.k.a. Theodore Geisel, used a peculiar kind of English. "The difficulty lay in translating peculiarities of one language into another, because each has its own words for humor, puns and other word play. But in the end, we felt that if Seuss had written it—*Cattus Petasatus*—in Latin, this is how it would have sounded," she says.

This is the second Seuss translation the couple has done. In 1998 the Tunbergs released a Latin translation of *How the Grinch Stole Christmas*, which has now sold over 41,000 copies. Both of their books are from Bolchazy-Carducci Publishers Inc., a small company specializing in classical languages and based in Wauconda, Illinois. *Grinch* got more than 200 reviews, far more than the firm's other popular books, including the cheerily titled *Rest Lightly: An Anthology of Latin and Greek Tombstone Inscriptions*.

The Tunbergs' admitted purpose in undertaking these time-consuming projects is to expand the popularity of Latin by giving students a lighthearted alternative to some Latin classics.

"The study of Latin, traditionally, can be a dreary business," Terry admits, adding that as a boy in an English boarding school he studied Latin and "hated it." With all the conjugations (*amo, amas, amat*), declensions, moods tenses and genders, it's no wonder, he says, that so

W R I T T E N B Y
J E F F W O R L E Y

many Latin textbooks were inscribed by their owners with the quatrain:

"Latin is a dead language,
It's plain enough to see.
First it killed the Romans
And now it's killing me."

Bringing Latin to life with the aid of Dr. Seuss is only one way that the Tunbergs are promoting the language. Every summer, they direct a one-week seminar at which the attendees (UK students and others) must sign an oath to speak nothing but Latin.

"One of the great things about Latin is that unlike other 'dead' languages its biggest literary tradition was when it stopped being anyone's native language," Terry explains. "My main research interest is the period before 1700 when Latin had a thriving literature and was *the* international language. In the 1600s, scholars spoke Latin. Newton wrote in Latin because it was so widely understood."

When approached by the publisher to translate Seuss, the Tunbergs were initially skeptical and concerned about their reputations as scholars. "We thought our colleagues might think we were spending a lot of time doing childish things," Jennifer says. But as the couple became immersed in the project, it became clear to them how much serious scholarship and research it was going to take to do justice to Seuss.

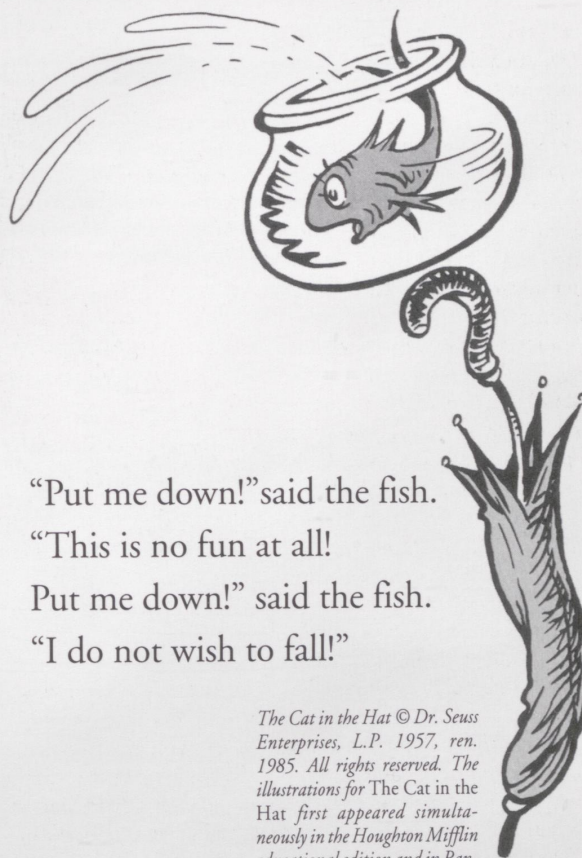
"In setting this within the tradition of Latin and neo-Latin literature, you're thinking about everything you know, everything you've read about the Latin tradition," Jennifer says. "What allusions—literary connections—would be appropriate to magnify the text? What would the right idiom be? Doing these translations is a payoff from years and years of continuing research."

She points out a further research aspect of the project is the lexicography included in the back of the book, which the two added as a teaching tool. Over 18,000 copies, hardbound and paperback combined, of *Cattus Petasatus* had been sold by August of this year, according to Laurie Haight of Bolchazy-Carducci. She says that 127 college bookstores have placed orders for the books and that "many high school Latin teachers have told us they plan to use the books in the classroom."

"I think we're contributing a lot to original scholarship because this work shows that Latin is not a dead language," Terry says. "A project like this shows how the Latin medium can be adapted to a contemporary work, that in 2001 it is still eminently possible to make an original contribution to Latin writing."

Putting new works, or works already familiar in other languages, in Latin (such as those by Seuss), especially if they are done in a way that uses the resources of the tradition, makes learning the language more effective and fun for young readers, Terry says. ❧

Clamat piscis et pavescit.
Circumspectat et tremescit.
"Ludum stultum iam remitte!
Nunc in mensam me demitte!
Ne mox cadam PERTIMESCO!
Tales ludos perhorresco!"



"Put me down!" said the fish.
"This is no fun at all!
Put me down!" said the fish.
"I do not wish to fall!"

The Cat in the Hat © Dr. Seuss Enterprises, L.P. 1957, ren. 1985. All rights reserved. The illustrations for *The Cat in the Hat* first appeared simultaneously in the Houghton Mifflin educational edition and in Random House's 1957 edition.

Where Is Kentucky Agriculture Heading?

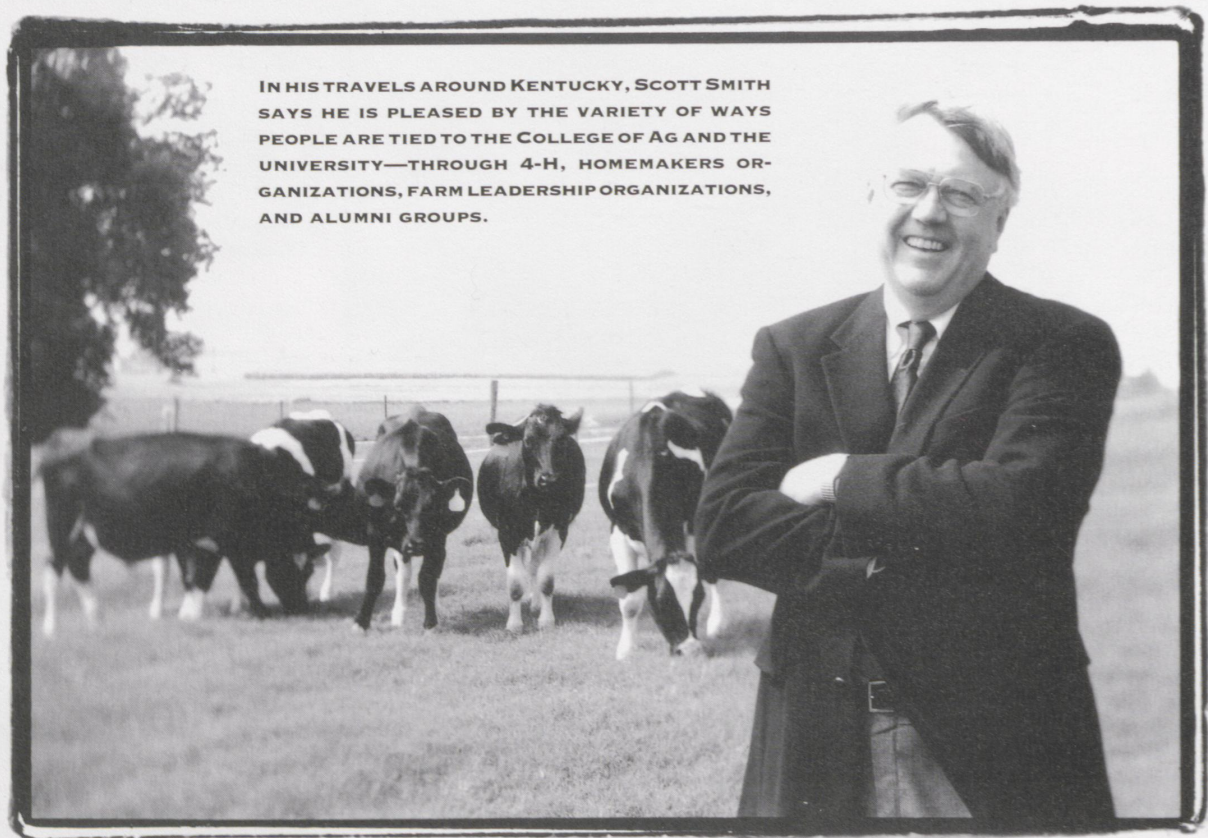
Upon the retirement of C. Oran Little, M. Scott Smith became the eighth dean of the University of Kentucky College of Agriculture in January of 2001. He also serves as director of the Kentucky Agricultural Experiment Station. As dean, he is responsible for all facets of the college—teaching, extension, and research programs. I met with Smith in his office on a blustery late-March afternoon to discuss the challenges and opportunities that lie ahead for the UK College of Agriculture.

—Editor's Note

When many people think of agriculture in Kentucky in the context of its future viability, they think naturally of tobacco. What is the future of tobacco in our state?

I believe that any discussion of the future of tobacco in Kentucky has to be taken up at the same time as issues of the family farm and of how we use our resources. Dramatic changes in tobacco production and marketing have combined with the broader forces on agriculture worldwide to create substantial challenges for our family farms and our communities dependent on a strong agricultural economy. The consolidation of agriculture in the state, the increase in farm size and the decrease in the number of farms all have to do with the future of tobacco. We have a huge responsibility in the College of Ag to try to contribute to a healthy resolution to these changes by, for instance, working with farmers on agricultural diversification—new crops that would reduce their reliance on growing tobacco. And this is especially important for small family farms.

IN HIS TRAVELS AROUND KENTUCKY, SCOTT SMITH SAYS HE IS PLEASED BY THE VARIETY OF WAYS PEOPLE ARE TIED TO THE COLLEGE OF AG AND THE UNIVERSITY—THROUGH 4-H, HOMEMAKERS ORGANIZATIONS, FARM LEADERSHIP ORGANIZATIONS, AND ALUMNI GROUPS.



Is the family farm disappearing in Kentucky?

Not as fast as some people might think. We have lost approximately 1,000 of 90,000 farms in Kentucky over the last year. Most of these were of the smaller variety—a couple hundred acres or less. It's almost as if we have two farming populations in this state: a small number of large, globally competitive farms, and a large number of small family farms that usually involve off-farm employment and part-time work since their total sales often aren't enough to provide full support for a family. But that's not to say these farms are less important than big farms; in many ways they're more important in terms of how local communities and economies are affected.

What would you tell a farmer who's having trouble making ends meet on a smaller farm or who wants to expand and become a full-time farmer?

Most small farmers either don't have capital to expand their operations or they're perfectly satisfied being a small farmer. If someone aspires to be among the six percent of large, globally competitive farms in the state, the technology and advice are available. Small farms sometimes are an economically viable choice; sometimes they have more to do with a choice about way of life than about economics. To provide increased income, small farmers need to look for special opportunities for new products and new farm sales, and there are lots of things they can do. Fresh-water shrimp, fruits and vegetables, organic produce or agricultural tourism. Though none of these alone will replace the tobacco crop, there are comparable opportunities.

What other immediate challenges does the College of Agriculture face?

Another major challenge comes from the recent reform of higher education—the mandate to become a top-20 research institution. The expectations are to elevate research productivity and research impact, which is consistent with what we do in the College of Agriculture. A research university is com-

mitted to discovery but also to transferring discoveries to practical use. The UK College of Agriculture, as a land-grant system, has always been about this.

But haven't the expectations of the college changed significantly in the last few years or so?

Absolutely. The charge that the College of Ag has to respond to is more complicated than ever. Agriculture itself, the mission of higher education in public institutions, and undergraduate education are all more complicated. And we have to mesh together everything we're supposed to do—research, teaching, and service.

What about support for your mission at the county level?

Local support is a tremendous resource for the College of Agriculture. Much of what we do in our 120 county offices is supported only by local resources. One of the unique things about the College of Ag that a lot of people don't understand is our relationship with the cooperative extension service and what that means. The emphasis here is on the word "cooperative"—programs funded by county, state and federal sources. We regard extension as a great model and so does our new president Lee Todd, because it delivers the benefits of higher education to local economies.

How do various locales around the state let you know what their agricultural needs are?

We're very much a grassroots organization. Our sense of direction is gathered from councils in every county, and much of what I do as dean is outside of Lexington. In fact, our programs in the College of Ag are sometimes more visible and better known in Western Kentucky and Eastern Kentucky than in Lexington.

Isn't it a challenge for the college to work in such geographically diverse areas?

Kentucky is a great state to work in for somebody in my position exactly because it

is so diverse—economically and culturally and geographically—which makes our challenge greater but also more interesting. The issues we face in Pike County or Bell County are completely different than most of the issues we face in Daviess County. It's been interesting as I've traveled around Kentucky to see how the land-grant system has adapted itself to different needs of various areas in the state.

What do you most like to hear from Kentuckians when you travel around the state?

The greatest thing to hear is the tremendous variety of ways that people are tied to the College of Ag and the university. Many of those ties are through extension—4-H, homemakers organizations, farm leadership organizations, alumni groups. There's such a wide range of ways through its extension program that the College of Ag has touched the lives of people.

I understand that your father was an extension agent. Are you following in your father's footsteps?

In a way I guess I am. I was born into the extension land-grant system—my father was a county agent in New York before I was born, and he became a county agent in his home county in New Hampshire right after I was born. Then he went back to school—Cornell College of Ag—and was an extension specialist for the next 30 years, working with county agents on farm finance issues.

As a kid, did you sometimes go with your father when he traveled in New York?

[Laughter]. Oh yes. I had two extension functions when I was extremely young. When I was around five, I would help him collate and put together extension materials in his office. In the summertime I was allowed to tag along when he met with county agents and at farmer meetings. So this has always been a way of life for me. ☐

Living with Diabetes:

UK Research Offers New Hope

Diabetes is a silent killer. The Centers for Disease Control and Prevention estimates 16 million Americans have diabetes, and 5.4 million of those people don't even know it yet.

Many people learn they have diabetes when they develop one of its life-threatening complications—blindness, kidney disease, nerve disease and amputations, or heart attack and stroke. For others, it's a routine insurance exam or pre-operative test that reveals the insidious disease. In any case, the diabetes diagnosis is the beginning of a lifelong battle, and researchers at the University of Kentucky are hard at work to discover new ways to prevent blindness and control diabetes through exercise and a change in eating habits.

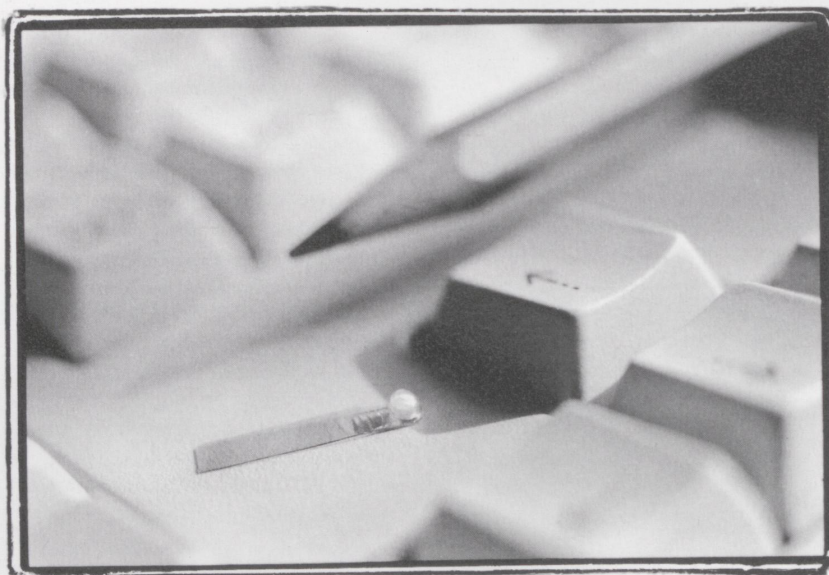
Seeing Is Believing

Fannie Miller's eyesight had been deteriorating for years. The 61-year-old Owen County resident, who had suffered from diabetes for 20 years, had been living with diabetic macular edema (DME), a condition that occurs when damaged blood vessels leak and cause retinal swelling.

DME is common in diabetics, because over time the disease often damages the retina, the structure in the eye that receives visual images. In fact, about 40 percent of the 10.3 million people in the United States diagnosed with diabetes will develop DME. Ultimately, DME can lead to blindness.

Back in Owen County, Miller was bumping into doors and walls. "I was on the verge of going blind," she says.

Miller had lost virtually all vision in her right eye, and now her left eye was deteriorating as well. That was making it difficult for her to live in her own home and care for her handicapped daughter. Miller had repeatedly undergone the standard therapy—laser photocoagulation, which uses lasers to reduce leakage into the retina or new blood vessels. This procedure was no longer effective, and there were no more treatments to try.



ENVISION TD, PICTURED HERE, IS A TINY POLYMER SHELL CONTAINING TWO MILLIGRAMS OF A DRUG PLACED ON THE END OF A PLASTIC STRIP. ONCE IMPLANTED, THE DEVICE SLOWLY RELEASES THE DRUG INTO THE EYE, REDUCING RETINAL INFLAMMATION.

Diabetes is the leading cause of blindness in people between the ages of 20 and 74, and if not for a new treatment developed by UK researchers, Miller might now be counted among this group. But hope came Miller's way in the form of a tiny implant device developed in part by P. Andrew Pearson, an associate professor of ophthalmology in the College of Medicine.

Called Envision TD, the implant was developed by Pearson and former UK researchers Paul Ashton and Thomas Smith.

Much of the initial work on the technology was conducted at the UK Chandler Medical Center, and the device is now licensed by Bausch & Lomb.

The implant is a tiny polymer shell containing about two milligrams of a drug, in this case fluocinolone, placed on the end of a plastic strip. While the patient is awake and under local anaesthetic, the device is inserted during a 15-minute procedure through an incision in the white of the eye and sutured in place. Once the device is

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Diabetes is the leading cause of blindness in people between the ages of 20 and 74.

secure, a tiny port in the polymer shell slowly releases a drug into the eye, reducing retinal inflammation.

The patient cannot feel the implant. And since the drug goes directly into the eye, only a small amount is needed. The implant delivers medication for up to three years. By that time, it is hoped that macular edema will have run its course.

Miller underwent the procedure in November of 1999, and her vision improved gradually.

She was one of five patients with DME who were part of an initial test of the device. The implants not only halted vision loss but produced measurable improvements for four of the patients, including Miller. At nine months, the patients' mean visual acuity (clarity or sharpness of vision) was dramatically improved—from 20/158 to 20/82. (20/20 vision is a term used to express normal visual acuity measured at a distance of 20 feet. If you have 20/100 vision, it means that you must be as close as 20 feet to see what a person with normal vision can see at 100 feet.) These results compare favorably to the control group, whose visual acuity remained essentially unchanged.

"The results of this study are encouraging, especially because these patients had failed standard treatment, making their cases very difficult to treat," Pearson says. The idea of sustained drug delivery to the eye is an approach Pearson has been working on since 1988.

"In most of the eye diseases we treat, the problem is on the surface of the eye," says Pearson. "The simple ways of treating these problems such as drops or ointments don't work for conditions in the back of the eye. Therefore, the mainstay of treatment has been systematic therapy (sending a drug through the entire bloodstream to reach the eye), but then you are saddled with high dosages of a drug to reach a therapeutic level."

In December 2000, Pearson began a Phase III trial of the device to treat uveitis, a severe

inflammatory condition in the eye caused by a problem in the immune system. The trial will be conducted at 30 centers across the United States.

Clinical trials are also continuing on the device and its use for DME. Beginning in early 2001, 90 patients were enrolled at four sites: UK, the University of California-Davis, the Kresge Eye Institute in Detroit, and the University of Wisconsin-Madison.

"The results with diabetics are exciting, and the results are dramatic," Pearson says, "but there is still a lot of work to do. We need to demonstrate effectiveness in a much larger trial."

For now, Fannie Miller is living proof to the possibilities.

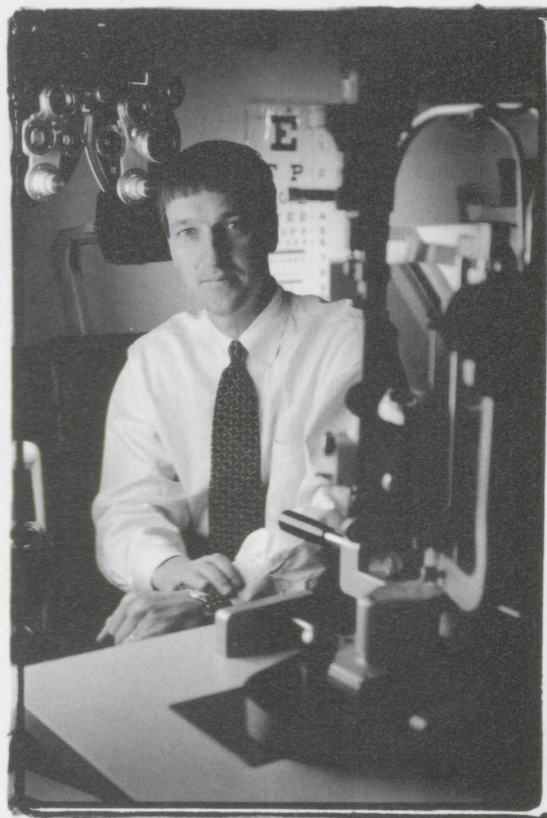
"I was going blind," she says. "Now I can do what I want to. I can read and pay my own bills. I can live in my own house. I can watch television without sitting right in front of it. I am very thankful."

Teaching Lifestyle Change

The link between diabetes and obesity is so strong that L. Raymond Reynolds, an associate professor of internal medicine in the College of Medicine's endocrinology division, often uses the term "diabesity" to convey how interrelated they are. And the bad news for diabetics is that all but one of the medications used to treat the disease cause weight gain.

"Insulin is a hormone that builds fat," Reynolds says. "So for the Type 1 diabetic who's recently been diagnosed and is under-

continued on page 20



OPHTHALMOLOGIST P. ANDREW PEARSON WAS PART OF A UK RESEARCH TEAM THAT DEVELOPED ENVISION TD, A NEW DEVICE THAT IS IMPROVING THE SIGHT OF PEOPLE WITH DIABETIC MACULAR EDEMA.

WRITTEN BY
ALICIA P. GREGORY
AND
DEBRA GIBSON



JAMES W. ANDERSON (LEFT) AND L. RAYMOND REYNOLDS ARE TESTING A LIFESTYLE PROGRAM THAT'S PROVEN SUCCESSFUL IN HELPING PEOPLE WITH DIABETES LOSE WEIGHT.

weight, it does wonders. But if you give too much insulin to the overweight Type 2 diabetic, it's a double-edged sword. It lowers blood sugar, but they gain weight and their blood pressure goes up."

Eighty percent of people with Type 2 diabetes are obese, and 80 percent of people with Type 2 diabetes die of heart disease. "We hear about things like cholesterol, blood pressure and smoking as risk factors for heart disease, but obesity just blows all those away," says James W. Anderson, a professor of medicine and clinical nutrition in the College of Medicine. "In people with diabetes, men have a threefold increased risk of heart disease and women have a fivefold increased risk."

Anderson says losing 10 kilograms (22 pounds) has a bigger impact on blood sugar than any of the current drugs for diabetes, except insulin. And Reynolds and Anderson's work has already shown that diabetics who lose weight can reduce, and sometimes eliminate, their insulin intake.

A recent six-month study, which Reynolds presented at the Endocrine Society meeting in Denver in June, showed that 21 obese patients (with Type 2 diabetes taking insulin) who underwent a targeted lifestyle program gained dramatic health benefits. The program was based on a 1,500 calorie/day diet (consisting of three packaged entrees, two low-calorie shakes, and five servings of fruits and vegetables) and exercise (40 minutes of moderate walking each day). Patients kept daily diaries of food intake and physical

activity, attended weekly behavioral classes, were weighed weekly, and had blood drawn at eight, 16 and 24 weeks.

"When we started, their average weight was over 200 pounds," Reynolds says. "At 12 weeks, they'd already lost over 15 pounds, and by 24 weeks, 18 to 20 pounds. They weren't losing huge amounts of weight, but were losing enough to bring their blood pressure, blood sugars, cholesterol, and triglycerides down, and these were people who had diabetes for about 15 years."

"People with diabetes have more difficulty losing weight than people without diabetes," Anderson adds. "And that may have something to do with diet fatigue. They've been on a restrictive diet for years and it's hard to intensify that diet." But the beauty of this study, say Anderson and Reynolds, is that it's not a starvation diet.

"They aren't just on a liquid diet," Reynolds says. "People are eating real food like fruits and vegetables." And the boxed entrees include chicken pasta parmesan and chili. These pre-packed meal replacements come from Health Management Resources (HMR), a national health-care company in Boston that specializes in programs for weight and health management. HMR provides programs to health-care professionals who have established more than 400 medically supervised weight-management programs nationwide. Anderson heads UK's HMR program, which began in 1985.

This study was funded by a grant from the drug company GlaxoSmithKline. "The reason they funded this research is that we elected to give their drug Rosiglitazone to half the patients in this study," Reynolds says. Rosiglitazone is an insulin sensitizer known to promote weight gain in some patients. The weight loss, blood sugar, blood pressure and lipid numbers at the end of the study for the people taking Rosiglitazone and the people who took a placebo were almost identical. "So what that told me is that the effect of the lifestyle change was

The link between diabetes and obesity is so strong that L. Raymond Reynolds often uses the term “diabetesity” to convey how interrelated they are.

really much more powerful than the effect of the drug,” Reynolds says.

“I think obesity is an area where there’s a lot of bias about treatment, just like there is about mental illness,” says Reynolds. “What we try to do with an approach like this is show people obesity is not necessarily a personal weakness or failure, it’s a cultural problem, particularly when 60 percent of Americans are overweight.”

“We used to say Type 2 diabetics were people over 40, but now we’re alarmed at how many adolescents are developing Type 2,” Anderson says, and he attributes this to the fact that 25 percent of children and a third of adolescents are obese.

Anderson’s next goal is to provide a low-cost weight-loss alternative for people with obesity and diabetes. “Our HMR program can be expensive, and people with diabetes have a lot of medical bills: test materials, co-pays on six or seven medications,” he says. “So what we’re trying to do is develop a

strategy that provides weight-loss intensity without the expense of hands-on medical supervision. I think that if we can train diabetics to use products like HMR entrees and shakes or Healthy Choice or even Slim Fast, get modest amounts of exercise and eat fruits and vegetables, we can change the way they manage their diabetes and improve their outcome.

“Last Thursday I saw a Methodist minister who enrolled in one of our first research projects 10 years ago. He lost about 40 pounds and went off insulin,” Anderson says. “Now he’s 79 years old, he swims three times a week, and he’s still off insulin. He’s on only one drug for diabetes. The 10-week program we introduced him to, with intermittent follow-up and an intensive one-year follow-up, has sustained him for 10 years. He believes this program saved his life.”

**Zyban:
The New Fat
Fighter**

Zyban, the prescription drug used to treat depression and nicotine addiction, is an effective tool in the fight against obesity, according to a new study by James W. Anderson, professor of medicine and clinical nutrition in the UK College of Medicine.

Zyban, or Bupropion SR, has been on the market for about 10 years but available in the United States only since 1998.

Anderson led a year-long study, funded by a grant from GlaxoSmithKline, the drug’s manufacturer. In the first six months of the study, 327 people between the ages of 18 and 65 who were considered obese took either a placebo, 300 milligrams of bupropion, or 400 milligrams of the drug daily. Each participant was also on a restricted diet, ate two meal replacements per day, recorded miles walked, and kept a lifestyle diary.

Those who weren’t taking the drug still lost weight—an average of 11 pounds over the six-month period—but study participants who took the drug lost, on average, twice as much weight—22 pounds.

In the second six months of the study, all participants received bupropion. Anderson says the drug reduces the flow of norepinephrine and dopamine, chemicals in the brain that regulate appetite.

“There are no magic bullets for treating obesity, but this does give us another tool in the toolbox. Diet and exercise are still the biggest keys to weight loss,” Anderson says, who presented the findings at the national meeting of the American Diabetes Association in Philadelphia in June.



Re-empowering the People

A Plan for a Resurgent Democracy

Richard Labunski becomes very impassioned when he talks about apathy. An associate professor in the UK School of Journalism and Telecommunications, Labunski has plenty to say about the indifference Americans show toward their government.

"In the 1996 presidential election only 49.5 percent of citizens who could have voted did so," he says. "That translates into 100 million people in this country in 1996 who were eligible to vote for president of the United States, but didn't vote. This was the first time since 1924 that voter turnout had been so low. And in 2000, with a very tough race and two candidates who stood for very different things, only about 51.5 percent voted."

Low voter turnout is only one symptom, Labunski says, that indicates the United States is in a significant political crisis. His years of research into the deepening schism between citizens and their elected officials in our country is the focus of his new book, titled *The Second Constitutional Convention: How The American People Can Take Back Their Government*, which was published last year.

"Disappointment, disillusionment, and distrust are words that many Americans would use today to describe their feelings about politics and government," Labunski says. "Probably at no time in our history have national and local political leaders and

institutions been held in such low regard. Even with the strong economy of the last decade, when most people have never been better off, there is a deepening cynicism about politics."

One of Labunski's major contentions in this book is that campaign spending is at the root of this disillusionment. "The way campaigns are financed is enough to demoralize anyone," he says. "As increasing amounts of money pour into campaigns, it becomes more difficult to run competitive races and almost impossible to defeat incumbents." During the last few decades, he says, U.S. House reelection rates have been 95 percent or higher, while the rates for senators are often 90 percent or more.

Incumbents, he says, start raising money for the next election the moment the previous election ends, even though there is no challenger in sight. "Unless you're a challenger with extraordinary financial means yourself, it's hard to get known, because voters don't hear all that much about a challenger who can't afford nearly as much TV time."

He believes that the growing influence of television and the cost of running campaigns have fundamentally changed the nature of politics. "Candidates used to give more speeches, hold more forums, and make themselves more available to voters," says Labunski. "Now, they spend so much time raising money to buy expensive television

time, there is much less time for interacting with people." He adds that when Scotty Baesler and Ernie Fletcher ran for the U.S. House in Kentucky's Sixth Congressional District last November, the two candidates spent a combined \$4.3 million on TV advertising alone.

The most formidable problem with campaign spending, Labunski says, is the "soft money" issue. "Because of a pernicious Supreme Court decision in 1976, *Buckley vs. Valeo*, and because of loopholes in the campaign finance laws, corporations, unions, political action committees, and wealthy individuals can make unlimited soft money contributions to political parties and so-called independent groups. Groups can spend as much money as they want as long as they don't directly coordinate their efforts with the candidates," he says, adding, "That is where much of the abuse of the system takes place."

Last June in a 5-4 ruling, the Supreme Court upheld strict limits on how much political parties can spend in coordination with congressional candidates. Although the split ruling didn't involve soft money, the majority seemed sympathetic to arguments that large contributions to parties can influence candidates. According to a story that appeared in *The Washington Post*, advocates of stricter campaign finance laws said they think the Court's approach would help them when judges review the soft-money ban pending in Congress.

Campaign finance reform is only one issue he tackles in *The Second Constitutional Convention*. In the 579-page book Labunski, who holds a Ph.D. in political science from the University of California-Santa Barbara and a law degree from Seattle University, also presents a case for passage of an equal rights amendment, a crime victims' bill of rights amendment, and abolition of the Electoral College.

W R I T T E N B Y
J E F F W O R L E Y

Lofty goals. But, realistically, how can such sweeping changes be made?

"The point of the book is that we can use Internet technology to do something unprecedented in the history of our country—hold a second constitutional convention," says Labunski, who explains that Article V of the Constitution provides this second method by which amendments can be proposed.

The Constitution has been amended 27 times in its 212-year history. Congress proposed all of the amendments as provided under Article V, the section establishing procedures for the proposal and ratification of amendments. "There is, however, another section of Article V—unknown to the average citizen—that requires Congress to call a constitutional convention if a sufficient number of state legislatures petition for it," Labunski explains. "The American people must dedicate themselves to forcing their elected officials to schedule such a convention if the people are to reclaim their government from those who are no longer answerable through the ordinary process of a representative democracy."

So, how would this work?

"This book proposes that through new communication technology such as the Internet, the American people can organize a series of meetings—beginning at the congressional district or county level, then moving on to a state convention, and finally culminating in a national 'preconvention' in Washington, D.C.—where petitions can be written to give to state legislators," Labunski says.

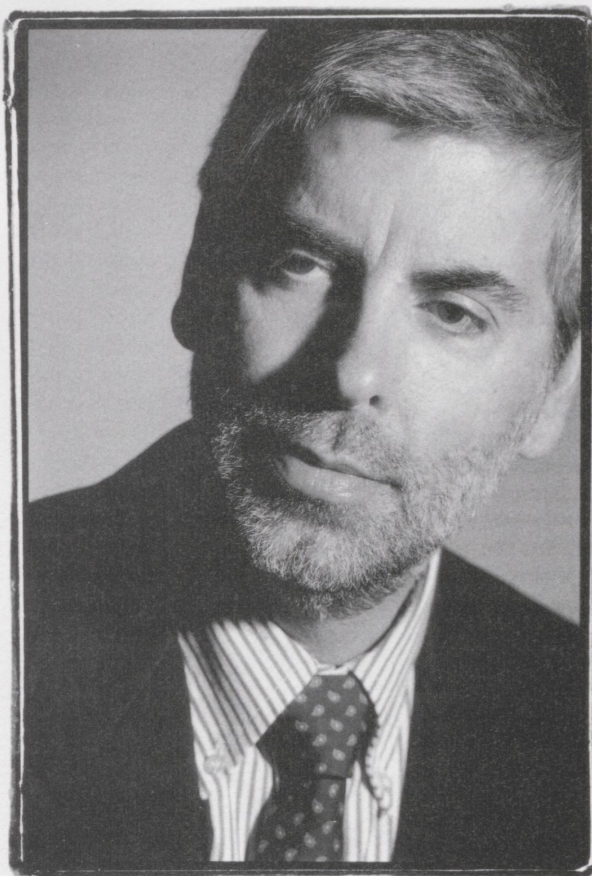
The petitions would propose a subject area for a constitutional amendment and ask legislators to forward them to Congress. "There is no precedent in American history for citizens on their own to try to organize a constitutional convention," he says. "Prior to the Internet, such an undertaking would have been almost impossible."

Labunski foresees the second convention Web site (www.secondconvention.org) as the national meeting spot, a sort of cyber-

space town meeting where people can get information about activities in each state as well as links to important documents related to the Constitution and the founding of the nation. The Web site would be, then, not only a political rallying point but a source of information.

Despite the glowing dust-jacket blurbs from other professors, presidents of national organizations, and hearty applause in the book's foreword by 1980 independent presidential candidate John Anderson, Labunski knows that, for many, this concept is a hard sell. In talking with people and promoting his book around the country (he recently appeared on "Book TV" on C-SPAN, for example), he says there is one dominant and recurring question: "This is all very interesting, Dr. Labunski, but what are the odds of this actually happening?"

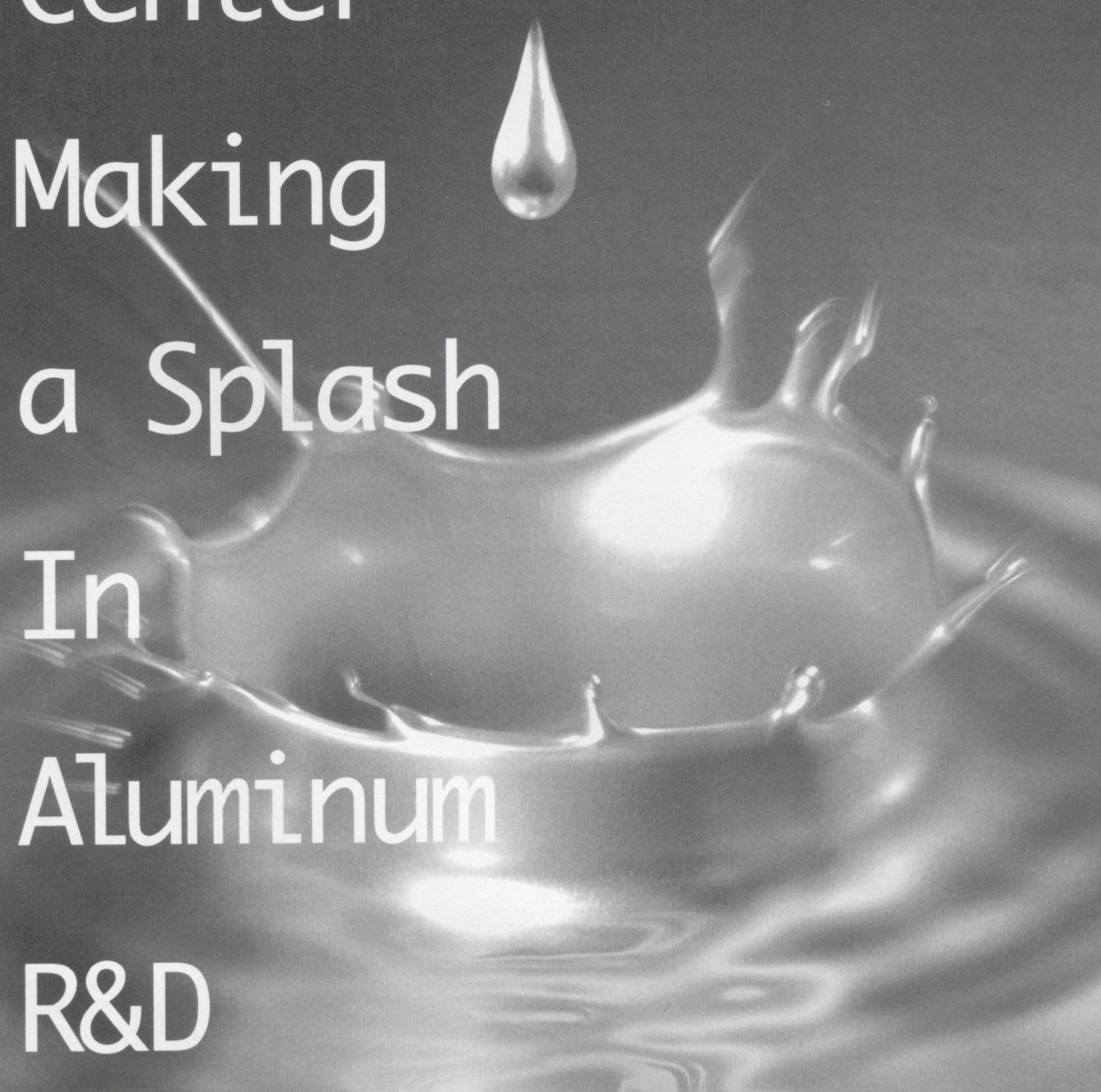
"Lots of people I've talked with think the likelihood of this happening is very small," he admits. "But if nothing else, the exercise of democratic principles and democratic energy would be worth it. I'd be pleased if there were at least a series of town meetings around the country where citizens gathered to discuss the Constitution," says Labunski. ■



IN HIS BOOK *THE SECOND CONSTITUTIONAL CONVENTION: HOW THE AMERICAN PEOPLE CAN TAKE BACK THEIR GOVERNMENT*, RICHARD LABUNSKI TACKLES THE ISSUES OF CAMPAIGN FINANCE REFORM, AN EQUAL RIGHTS AMENDMENT, A CRIME VICTIMS' BILL OF RIGHTS AMENDMENT, AND ABOLITION OF THE ELECTORAL COLLEGE.

WRITTEN BY
JEFF WORLEY

New UK Center Making a Splash In Aluminum R&D



In his office at UK's Coldstream Research Campus, Subodh Das leans back in his swivel chair, laces his fingers behind his neck, and says, "I love this job—I just love it."

Das's job is selling aluminum or, more precisely, selling the aluminum industry on the idea of partnering with the university to sponsor new research and development. The end-goals of this coalition are more efficient manufacturing processes, and better and less costly products for all of us. In talking about this partnership, Das evinces an almost evangelistic fervor.

"Well, yes, I guess you could say I am a man on a mission," says Das, who directs the new Center for Aluminum Technology (CAT) at the University of Kentucky's College of Engineering. "But how can you not love a venture like this where everybody wins—industry, researchers, the university, and the general public?"

In part, he says, university researchers are filling a void that has resulted from what Das calls a "megatrend" in the United States—the disappearance of company-sponsored R&D facilities in the aluminum industry. He explains that most research labs have folded because the companies can no longer afford them. Such research enterprises are too expensive, it's too risky to gamble on results that may or may not pay off, and the increasing legal complexities of licensing intellectual property—discoveries made in the lab—are daunting.

Das says universities have a unique opportunity to fill this vacuum. "It's an ideal combination. Universities have the brainpower to work on problems that in-

dustry identifies, and industry has the means of production ready to roll. It's all about sharing." He emphasizes that in this operation he's not much interested in research for its own sake. "You have to think of potential users. It's not just the creation of new knowledge that's important. How can that knowledge—that new process or product—be implemented to help people solve a problem?"

In addition to his role as director of CAT, Das also serves as president and chief operating officer of Secat, a for-profit corporation that finds researchers for companies. In his role as matchmaker, Das talks with numerous companies to identify common research needs.

Secat then works with national funding agencies such as the Department of Energy to gain support for these projects. In this way, Secat acts as a research brokerage. Das explains: "Having identified the aluminum industry as one of nine sectors critical to the national economy, the DOE awards research funds for projects that will help the aluminum industry find ways to cut costs and stay competitive in a global economy."

Why UK?

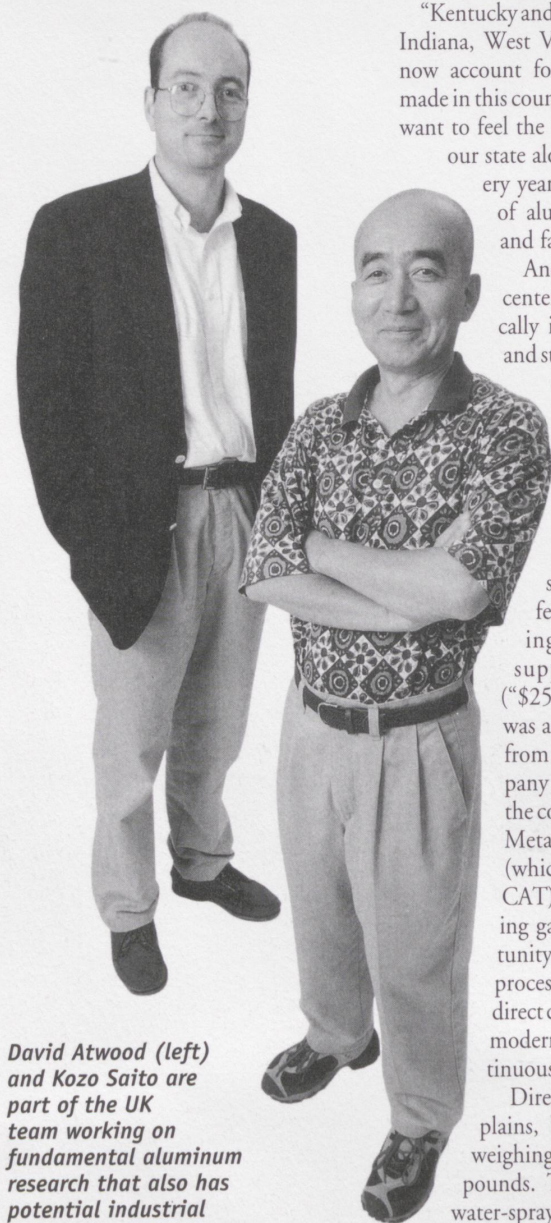
It may come as a surprise to many that the Commonwealth of Kentucky is big on aluminum, very big. "If Kentucky were a country," Das ex-

"How can you not love a venture like this where everybody wins—industry, researchers, the university, and the general public?"

—Subodh Das



*continued on
page 26*



David Atwood (left) and Koza Saito are part of the UK team working on fundamental aluminum research that also has potential industrial applications.

claims, "it would have the world's greatest concentration of aluminum facilities." The state has 80 aluminum plants involved in production and fabrication, and according to the Kentucky Cabinet for Economic Development, the Kentucky aluminum industry employs nearly 12,000 workers. Paul Coomes, a professor of economics at the University of Louisville, has calculated a total state payroll of \$543 million and has figured the average industry salary at \$48,578 a year.

"Kentucky and three contiguous states—Indiana, West Virginia and Tennessee—now account for half of the aluminum made in this country," Das says, "and if you want to feel the weight of the industry in our state alone, think about this: Every year over two billion pounds of aluminum is manufactured and fabricated in Kentucky."

Another reason to locate the center in Kentucky, and specifically in Lexington, is the long and strong history of aluminum research at UK.

"We've been doing research in aluminum here in the College of Engineering since 1959—all aspects of physical and mechanical metallurgy," says Jim Morris, a UK professor of materials engineering. Significant financial support in the 1970s ("\$250,000 a year for five years was a lot of money back then") from Continental Can Company of Connecticut enabled the college to establish the Light Metals Research Laboratories (which has now merged with CAT). Morris says that this funding gave researchers the opportunity to study the materials and processes involved in traditional direct chill casting versus the more modern strip-cast (also called continuous-cast) process.

Direct chill casting, Morris explains, begins with huge ingots, weighing from 30,000 to 50,000 pounds. The ingot is chilled in a water-spraying process. Then it undergoes a thermomechanical process that

involves a series of time-consuming steps, including "homogenizing" it in a furnace at around 1100 degrees Fahrenheit and then treating the ingot in a three-story-high hot-rolling breakdown mill. After a few more treatments, the ingot is finally broken into a plate about an inch thick.

"The strip-cast process is much simpler and a whole lot less cumbersome than that," Morris says. "A strip-casting machine casts materials slightly less than one inch thick and casts continuously for several days. After it is cast as a plate five feet wide, it is thermomechanically processed. This plate then goes immediately into the hot rolling mill, bypassing a lot of the steps involved in direct chill casting." The properties and characteristics of aluminum cast in this way are totally different from those that result from the traditional process, Morris adds.

"We've done more aluminum strip-cast research—by far—than any other university in the country," Morris says, "and probably more than all other universities put together."

If the strip-cast process is so much less cumbersome, why is the older process still being used by roughly 80 percent of aluminum-processing companies?

"Two words," Das says: "sunk capital." The aluminum industry, he says, has invested billions of dollars in equipment, and though the last direct chill casting plant was built in 1983, it wouldn't make economic sense for these companies to scrap all this equipment and start with a clean slate. Most new operations Das can think of, however, are utilizing the continuous-cast method, refined and improved over the years in part by Morris and a series of postdocs and graduate students at UK.

The Funding Challenge

Das came to UK in 1999, after retiring as vice president for research at ARCO Aluminum in Louisville. It was then that he "began to get a fresh feel" for aluminum research.

"In several discussions with Jim Morris and Tom Lester [dean of the UK College of Engineering], it became clear to all of us that aluminum research was meager, nothing was happening out there. When Tom started talking about some important new funding for UK, from the Research Challenge Trust Fund (RCTF), we started to get excited. The

College of Engineering was soon to benefit from this initiative, and we began to talk about new directions in aluminum research and how UK could play an important role."

"Jim and I spent a fair amount of time in the early '90s visiting aluminum companies in the state, and it became clearer and clearer how much they depended on our materials sciences program for expertise and also a supply of young Ph.D.s from UK," says Lester. "In part to solidify our role with the aluminum industry in the state, we merged the departments of materials sciences and engineering with chemical engineering in 1994," he says.

As far as the UK-aluminum industry tie, though, Lester gives Morris the lion's share of the credit. "Jim has been proselytizing about the importance of aluminum to the university and to the state for over 40 years. Basically, he's been the Lone Ranger of Aluminum around here for a long time." Morris says his best guess is that over the years around 60 students have graduated from this program with an emphasis on aluminum research.

With additional encouragement from Mark Durst, president of ARCO in Louisville and his former boss, Das and Lester arranged a meeting with top UK administrators and the Kentucky governor. The meeting went well—the concept of an aluminum technology center at UK was greeted warmly. In the coming weeks, UK was able to commit \$1.2 million for the land and building needed; the state, on top of the \$2 million from the RCTF, added nearly \$2 million for laboratory equipment. Now it was time for Das to see what industry support he could drum up.

"I started knocking on a lot of doors and spending hours on the phone," Das recalls. "If this was going to fly, we needed to get industry to literally buy into it." A few months later, his success surprising even Das a bit, 16 aluminum companies around Kentucky had committed a total of nearly \$2 million, matching Patton's support for lab equipment, to help the center get moving.

"The fun really started then," Das says. "In March 1999 we sponsored a workshop attended by representatives of The Aluminum Association, whose member companies operate almost 200 U.S. plants. After identifying specific research areas of inter-

est to industry members, we met with some people at DOE. Secat then submitted research proposals to the agency."

To date, these efforts have been rewarded by a cost-sharing, total funding package over three years of \$15 million—\$7.5 million from DOE and the other \$7.5 from the aluminum industry. Das is quick to point out that most of this funding, around \$13 million, is being used to support researchers at national laboratories throughout the United States as well as UK researchers.

"Our charter at Secat is to serve industry by linking them up with the best researchers in labs around the country that have the best resources for their particular work," he says, adding that it would be wasteful for the aluminum industry to duplicate spending on expensive equipment in other U.S. labs.

The CAT: Off and Running

Secat is currently funding four projects at UK, totaling \$2 million, all initiated by concerns and problems voiced by the aluminum industry. In addition to Morris's research into the strip-cast process, Kozo Saito in mechanical engineering is hard at work on two projects and David Atwood in chemistry is heading up a fourth project.

One problem identified by a number of

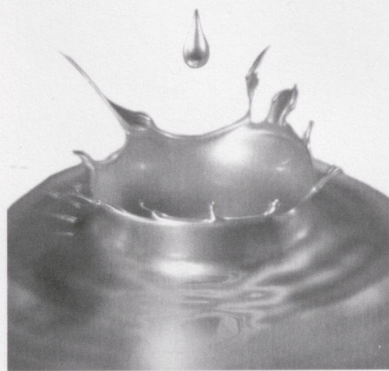
"Universities have the brainpower to work on problems that industry identifies, and industry has the means of production ready to roll. It's all about sharing."
—Subodh Das



PHOTO COURTESY OF ALCAN

"Full-scale implementation of the results of David Atwood's research could lead to a savings of more than 50 trillion BTU by the year 2020, an energy savings equivalent to running the city of Lexington for one year for free."

—Subodh Das



aluminum companies is the incidence of stress cracks in ingots produced in direct chill casting. Cracks form during the cooling process, and to eliminate these cracks the ingot has to be "scalped," a process that results in aluminum scrap waste. It is estimated that scrap reduction could mean an annual energy savings in the United States of over six trillion BTUs and a cost savings of over \$25 million by 2020. To respond to this challenge, Das called in a local expert.

UK's Saito, termed the "resident fire man" by a few of his colleagues in mechanical engineering, was happy to go to work on the aluminum casting process problem. "For the past 17 years, I've been doing research on heat transfer, specifically on the spread of fire. Using infrared techniques, you can do what we call 'temperature mapping,' which also applies to the forming and cooling of ingots."

To have a close-up look at the casting process, Saito went to several aluminum companies in the state to observe and to take some notes. "Once the hot liquid is poured into a container, it has to be cooled by water spray," Saito says. "And when the spray is uneven or perhaps too forceful, cracks can result. My task is to try to figure out what kind of cooling system would eliminate the cracks."

Once Saito gets the data he needs from the company in Spokane, Washington, that makes the ingot, he plans to use computer modeling to determine possible solutions. "It might turn out that more of a fine mist is needed, or maybe we could adapt some process of film cooling." In this process, Saito explains, cool air is discharged through small holes to provide a thin, cool insulating layer along a hot surface.

Saito is also involved in a second project, working on the problem of how to increase furnace combustion efficiency and, again, his work with fire may provide an answer.

"We already have some ideas about this," he says. "One possibility would be to make what we call a fire tornado, which would result in a more compressed and tighter flame." To achieve this, Saito would remodel the furnace by adding some side vents through which air would be guided to twist the flame into a rotary motion. "This mixing of air and fuel can achieve much better combustion," Saito says. "We've shown this on a smaller scale, and we be-

lieve it can work on a larger scale, too."

Das estimates that full-scale implementation of this second project by 2015 will lead to yearly energy savings of 13 trillion BTU and an energy cost savings of \$57 million a year for the U.S. aluminum industry.

Nullifying Oxide

Another major problem identified by aluminum company executives involves severe oxidation of aluminum during heating and melting phases. Even though aluminum automatically obtains an oxide coating, this treatment does not keep it from being converted to dross as the temperature reaches 1000 F in the presence of oxygen.

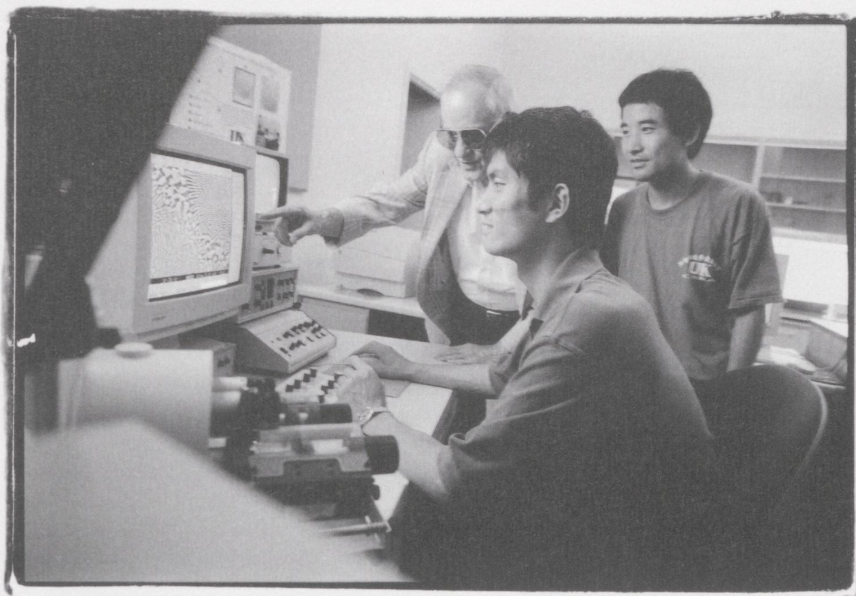
"We're trying to prevent this enormous loss of aluminum due to runaway oxidation," says David Atwood, an associate professor of chemistry who came to UK three years ago. He explains that one unique characteristic of aluminum is its strong tendency to form bonds with oxygen.

"This is advantageous at low temperatures where the oxide forms a protective coating. However, at higher temperatures the oxide growth continues past the surface of the metal and will consume almost half of the molten aluminum present." This oxidation problem was handed to Atwood and his graduate students by Subodh, representing the needs of the industry. And Atwood along with his research group, which he characterizes as "a very talented team of graduate and undergraduate students doing fundamental aluminum research," have recently made a key discovery in this work—something, he says, that hasn't been identified before.

"We've found that there's a process occurring that facilitates oxidation of aluminum," Atwood explains. "It isn't the oxidation process itself, but a precursor, a catalyst in a sense, that is responsible for the oxide loss."

Although he is bound by a confidentiality agreement with the company sponsoring this work, he can say he believes he and his students are close to being able to prevent this catalytic reaction from taking place. He adds that this discovery, like many scientific advances, happened because of a lucky accident.

"When a group of my guys doing environmental chemistry were working on ways



Jim Morris, seen here with doctoral student Jiantao Liu (seated) and postdoc Xiang Ming Cheng, has been involved in aluminum research at UK since 1959.

to prevent acid drainage from coal mines for the gas and mining industries, we discussed ways of preventing pyrite dissolution (the main cause of acid drainage). When we finally hit on a good solution, it dawned on me that this process and the process of aluminum oxidation were actually the same chemical phenomenon. It was like the sky suddenly opened up!" He adds that he and his team still have a lot of work to do to fully characterize the chemical process.

"In the short run, however, we're optimistic that within a year or two, at most, Secat will be able to offer practical suggestions for preventing aluminum melt loss," says Atwood.

"In the U.S. aluminum industry, over 100 trillion BTUs are lost as a result of oxidative melt," Das explains. "Our goal in this project is to achieve a 50 percent reduction in this melt loss. Full-scale implementation of the results of Atwood's research could lead to a savings of more than 50 trillion BTU by the year 2020, an energy savings equivalent to running the city of Lexington for one year for free."

"Here's the key thing about all of this: insightful people like Subodh and the others working on this project recognize the importance of a team effort like we have here," Atwood says. "Good ideas can come

from anywhere. And scientific curiosity clearly does not exclude industrial applications."

Fulfilling the Land-Grant Promise

Das seems totally ready for the devil's-advocate questions: Is it really such a good thing that the university is getting so cozy with industry? Doesn't such work detract from the concept of professors pursuing lofty ideals and scholarly goals?

"Not at all, not at all," Das counters. "Actually, by doing this work we are satisfying all three missions of being a land-grant university. We're doing original research, we're improving the lives of people throughout the state, and we're educating and graduating students." He adds that many of these students will work in various capacities in the aluminum industry, which means they'll likely be staying in the state.

"With a consortium like this that furthers the goals of all three aspects of the university's mission, we're unique. We're probably the first in the country to do this." Das believes, too, that an additional benefit of CAT may well be its function as a role model. "If this model can work for aluminum, it can work for other industries," he says. ☐

***"Good ideas can
come from anywhere.
And scientific curiosity
clearly does not exclude
industrial applications."***

—David Atwood

USING "KNOCKOUT MICE" TO FIGHT EPILEPSY

WRITTEN BY
JEFF WORLEY

Graduate student Xuan Nguyen says that his current research project began with some well-traveled mice.

"Before I came to UK, I was working at a private medical research foundation in Oklahoma City, doing behavioral studies with mice. My mentor and I were focusing on one particular peptide to find out its role in learning and memory," says Nguyen, who was born in Vietnam but has spent almost his entire life in Oklahoma. And when he came to UK, Nguyen brought his mice with him.

These aren't your run-of-the-mill mice, he says. These are "knockout mice."

"Knockout mice are genetically modified—a particular gene has been selectively removed. In our case, the gene of interest is prodynorphin, which encodes a precursor for a series of peptides present in the brain that may play an important role in neuron function. By studying mice that lack prodynorphin, we hope to be able to determine whether this gene is needed for certain physiological or behavioral effects," Nguyen explains. This work has potential applications in understanding and treating age-related cognitive decline and epilepsy.

His mentor in this project is Guoying Bing, a recent hire in the UK Department of Anatomy and Neurobiology, who worked with Nguyen in Oklahoma. "I wanted to continue my work with Dr. Bing," Nguyen says, "so here I am."

"We met in the Free Radical Biology and Aging Program at the Oklahoma Medical Research Foundation, where Xuan had begun his graduate studies," says Bing, an associate professor. "Our preliminary studies and data from other laboratories suggested that prodynorphin-derived peptides may contribute to age-dependent changes in learning and memory. These studies involved analyzing the ability of the mice to acquire and retain spatial information in a common behav-



GRADUATE STUDENT XUAN NGUYEN IS WORKING WITH "KNOCKOUT MICE," RESEARCH THAT MAY CONTRIBUTE TO OUR UNDERSTANDING OF AGE-DEPENDENT CHANGES IN LEARNING AND MEMORY.

ioral task known as the Morris water maze swim task (a mouse in a tank of water has to swim to a slightly submerged platform, then on subsequent trials remember where that platform is). We plan to confirm these findings by conducting other behavioral, physiological, and biochemical tests on these mice."

Bing was quite pleased when he found out Nguyen was planning to follow him to Lexington. "Xuan has a very solid science background. He's received numerous awards for his scientific research, he is intelligent, and he's eager to collaborate with other scientists. Basically," Bing adds, "Xuan has all the qualities that a good scientist is supposed to have."

In Oklahoma in the spring of 1999, Nguyen applied for and won a prestigious Howard Hughes Medical Institute Predoctoral Fellowship, which is designed to support Ph.D. students and medical scientists. This fellowship was worth \$34,000 last year—\$18,000 went to Nguyen and the rest was awarded to the school to pay his tuition, health insurance, and travel and research expenses.

A second fellowship, awarded to Nguyen soon after he started his graduate studies here, came as a total surprise, he says.

"Yes, I was pleasantly shocked to find out that I'd been given a Graduate Student Incentive Program award by the UK Gradu-

ate School," he says. This stipend is available, on a competitive basis, to any graduate student who has been awarded a national fellowship worth \$10,000 or more annually, according to former Graduate School Dean Mike Nietzel. "The Graduate School provides a five percent supplemental stipend through this initiative, says Nietzel, who now serves as the academic provost at UK. "For the 2000-2001 academic year, six UK graduate students won this award." Applications for this stipend are available on the Graduate School Web site, www.rgs.uky.edu/gs. "We think of this award as an 'added incentive,' for both the student and the student's department," Nietzel explains.

Other current recipients of the Graduate Student Incentive Program stipend represent the departments of agricultural engineering (2), anatomy and neurobiology, mechanical engineering, pharmacology, psychology, toxicology, and Spanish. ❖



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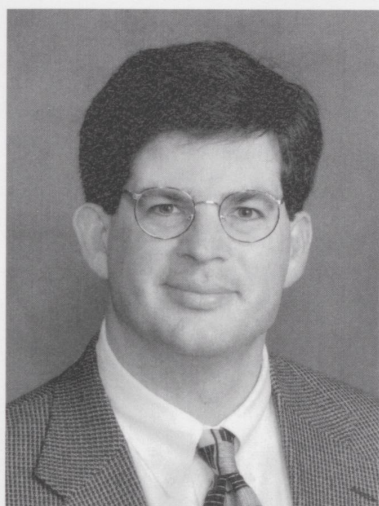


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ALUMNI ACHIEVEMENTS



Walter J. Ferrier, M.A. *International Commerce* '88, associate professor of management in the UK Gatton College of Business and Economics, won the Best Paper Award for his research paper titled "The Role of Competitive Action in Market Share Erosion and Industry Dethronement: A Study of Industry Leaders and Challengers," which was published in 1999 in the *Academy of Management Journal*. Ferrier says a unique feature of his research is his use of "sequencing" (very similar to the technique biologists use to sequence DNA) to map out and compare the pattern of competitive moves that big firms (mostly Fortune 500 companies) carry out to gain market share, increase profitability, and stock price. He earned his Ph.D. in management from the University of Maryland in 1995.

Diane S. Grimes, M.A. *Anthropology* '90, is an assistant professor in the speech communication department at Syracuse University in New York, where she teaches organizational communication, gender and communication, managing diversity, and small-group communication. The *Journal of Organizational Change Man-*

agement, Electronic Journal of Radical Organization Theory, and Management Communication Quarterly have published her articles, which focus on race and gender in relation to communication, representation, identity, and power interests in organizations. Grimes earned her Ph.D. in organizational communication from Purdue University in 1996.

Philip Jenks, Ph.D. *Political Science* '00, is an assistant professor in the university studies department at Portland State University. He presented a paper titled "On Domination: An Inquiry into the Problematics of Contemporary Theories of Resistance," with fellow UK political science alum Hugh Bartling, at the Western Political Science Conference in March in Las Vegas. Jenks also had two poems published in the March 2001 issue of *Chicago Review*, and a selection of his poems will be featured in the ninth edition of *LVNG*, a journal of poetry and fiction. He has a book of poems due out October 2001 titled "On the Cave You Live In" (available at www.floodeditions.com).



Lucretia Mattson, Ph.D. *Business Administration* '83, is an associate professor of

accounting and finance at the University of Wisconsin-Eau Claire. In 2000 she received an Excellence in Teaching Award (nominated by the three previous graduating classes) and the Excellence in Service Award (selected by a faculty committee). Mattson is the second woman in the 95-year history of the Wisconsin Institute of Certified Public Accountants to serve as the organization's president. She is also the advisor for the Student Accounting Society Volunteer Income Tax Assistance project, a community service project in which accounting students provide free tax preparation to elderly and low-income people.

Randy Ziobro, M.S. *Physical Therapy* '98, founded www.fixyourbody.com in 2000. The company, based in Portland, Oregon, with offices in Seattle and San Diego, offers online "injury solutions packages" which feature step-by-step directions for exercises that treat back and knee pain, and injuries common in sports such as golf and running. Ziobro says his goal is to save patients time and money by correcting injuries before they cause chronic pain and require repeated trips to the doctor. Ziobro has worked as a physical therapist for the University of Kentucky men's basketball team and the San Diego Padres major-league baseball team. ☐

KIOSK

NEW DIRECTOR SEES BRIGHT FUTURE FOR CAER

With rolling blackouts, soaring pump prices, and doubling heating bills, energy issues are in the press and on our minds. And Ari Geertsema, who took over the helm of the state-mandated Center for Applied Energy Research (CAER) at UK in February, says this is an opportune time to take a fresh look at what needs to be done.

Geertsema, who most recently served as gas-processing manager at the Commonwealth Scientific and Industrial Research Organization in Australia, brings more than 30 years of experience in industrial chemistry, chemical engineering, plant operations, and research and development to this new position. In South Africa, he served as managing director of the internationally recognized Sastech Research and Development Division of Sasol for 10 years. Sasol, one of the biggest coal producers in the world and leader in coal conversion, processing and utilization technologies, processes more than 40 percent of South Africa's liquid fuel needs.

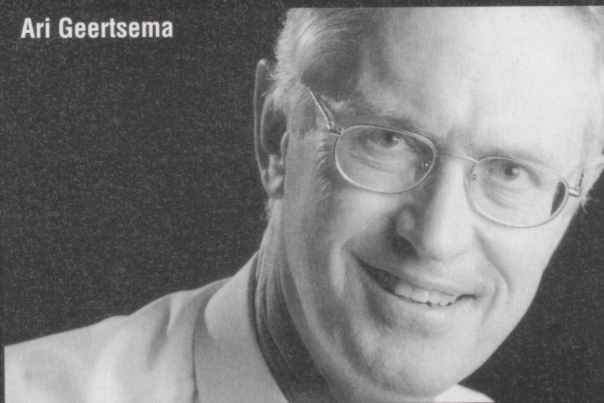
"Any energy solution is going to take time to implement," says Geertsema, who earned his Ph.D. in chemical engi-

neering from the University of Karlsruhe in Germany and an M.B.A. from the University of Potchefstroom in South Africa. "We shouldn't forget that Kentucky, at this moment, has the cheapest electricity rates in the United States. I think we have to, as a state and also as a center supporting this industry, make sure that position is maintained because Kentucky's economic growth will be very strongly influenced by having cheap power. It will draw investors in, and it will draw big industries."

Geertsema recognizes that attracting big industry to Kentucky is not without objections because of potential negative environmental impacts. "CAER is in a very good position to contribute to a balance between energy growth, responsible generation of energy, and environmental care," he says. In fact, one of the center's research groups was recently renamed "Environmental and Coal Technologies" to reflect that focus.

"Almost all the power we use every day comes from coal, and coal is no longer as environmentally unfriendly as people perceive it to be," Geertsema says. CAER has significant ongoing research projects funded

Ari Geertsema



by the U.S. Department of Energy to deal with the solid residues from burning coal. Researchers are retrieving useable coal from fly ash, a by-product of burning coal, and separating a low-moisture, clean-coal product from slurry. By recycling current waste products, the energy potential and environmental safety of coal are increased.

"CAER is committed to investigating technological developments that are industrially applicable and can lead to economic growth," he says. "In this category I'd put our work in carbon materials, which includes nanotubes [cylindrical structures measuring only a few atoms in circumference that conduct electricity and are stronger than steel]."

Geertsema also says that the center's work in catalysis—using catalysts (agents that facilitate chemical reactions) to produce clean fuels

from oil, coal and natural gas—will have great commercial significance in the future. "This work is not a cure-all for the United States' dependence on foreign oil, but it will certainly give a better balance and provide much cleaner fuels than our refineries currently produce."

Geertsema says CAER's strong academic link with UK and ongoing relationships with energy companies allow it to bridge the gap between the academic and scientific worlds and what he calls the "real-life dollar world." "I believe because of my background, I can speak both languages and help these two groups look in the same direction and see one another as complementary, rather than as adversaries." CAER currently has significant collaborations with 20 industrial partners.

This relationship with industry is additionally beneficial to UK students. Undergraduates, graduate stu-

2001-2002 RESEARCH PROFESSORS

JOHN THELIN

dents, and postdoctoral researchers have an opportunity to experience the "work world" firsthand. "Because of that experience, we see quite a number of the students who have gone through CAER get pretty good positions in industry. This is sometimes to our own detriment, because the best people get recruited, but that's part of our calling," Geerstema says.

Geerstema takes a proactive viewpoint on funding. "We need to be involved in the political decision-making process for funding. We've got to be part of defining what needs to be done."

Founded in 1977 to research new sources of energy and new ways to use coal, CAER conducts research in catalysis, carbon materials, and coal and environmental technologies.

—ALICIA P. GREGORY

Some historians like to focus in on an event or major figure and make that their life's work. John Thelin, professor in the UK Department of Educational Policy Studies and Evaluation, who teaches the history of public policy and higher education, is another kind of scholar.

Thelin, one of four University Research Professors this year, is taking a longer view: during his research professorship he plans to research and write a fresh historical analysis of American higher education from the 17th century to the present.

"I admit this is an ambitious undertaking," says Thelin, who came to UK from Indiana University six years ago. "But it's a timely and significant project, and an appropriate match for UK's research professorship program because such support provides exactly the kind of resources I need to complete the work." The award will support his archival research, travel to libraries, acquisition of primary sources, and documentary analysis.

Thelin was prompted to pursue this research project because the editor of the Johns Hopkins University Press suggested there is a growing demand for such a book. "This is a major project that, to my surprise, has gone begging," Thelin says. He explains that in 1962 Frederick Rudolph, a professor of history at Williams College, wrote *The American College and University: A History*. The book

is lively and well written, Thelin says, but it went out of print in 1986.

"In 1990 when this classic work was re-published, Professor Rudolph asked me to write an introductory essay and a bibliographic essay for its new release. Now, a decade later, I'd like to go beyond that supporting role and offer my own original narrative and analysis on the topic," says Thelin.

He adds that two factors make Rudolph's work incomplete today. First, his account stops around 1960; second, during the past four decades many important events occurred that have yet to be incorporated into an historical perspective.

"During this time, there have been numerous articles and monographs by excellent historians dealing with specific aspects of higher education," Thelin explains, "and these secondary sources haven't been adequately brought into the interpretation of American higher education, whether we're looking at 1636 [the founding of Harvard] or 2000." Themes of gender and race, for example, receive scant attention in the classic works published three or four decades ago. "My work will draw from materials and articles I've been working on for over 20 years," he adds.

Rather than visiting one or two important archives during the coming year, Thelin plans to spend shorter stays at eight libraries around the country.

"These shorter visits are

possible now because of a major change in how we can do archival research. By thoughtfully using e-mail and the Internet, you can do lot of background work before you visit, so I see a number of two-week trips—to the Library of Congress in Washington, D.C., and Johns Hopkins University, for example. Corresponding with archivists to line things up ahead of time is a much better use of everyone's time," he says.

"I'm very grateful to my departmental colleague Alan DeYoung, who nominated me," he says. "What is most gratifying about this award is the idea of being acknowledged and accepted by faculty peers at a very diverse university like UK."

—JEFF WORLEY

UNIVERSITY RESEARCH PROFESSORSHIPS

The research professorships were established by the UK Board of Trustees in 1976 to provide an opportunity for concentrated research and recognize outstanding research achievement. The professorships carry an award of \$35,000 to enable research professors to devote full time to research or continue to teach and use the award to support research activities. Funds to support the annual awards are provided by the Office of the Vice President for Research.

2001 RECIPIENTS:

Robert Perry (Microbiology and Immunology)
John Thelin (Educational Policy Studies/Evaluation)
Thomas Widiger (Psychology)
Chi-Sing Man (Mathematics)

2001-2002 RESEARCH PROFESSORS

ROBERT PERRY

The infection that killed 25 million people in Medieval Europe may hold the key to tomorrow's anti-bacterial and anti-tumor drugs. These potential applications, as well as a fundamental need to understand this devastating killer, are why Robert Perry has dedicated more than 20 years of research to *Yersinia pestis*, the bacteria that causes bubonic plague.

"It's one of the most virulent forms of infection, so it's rather infamous," says Perry, a professor of microbiology and immunology in the UK College of Medicine and recipient of one of four University Research Professorships at UK this year. "I'm interested in *Yersinia pestis* for two reasons: first, this organism is extremely efficient at circumventing our host defenses; and, second, it has an interesting life cycle."

Plague is a vector-borne disease, meaning it grows in fleas and the flea injects the bacteria into mammals, usually rodents. Other fleas catch the bacteria by feeding on infected rodents. "The bacteria go from living in the stomach of a flea to growing in a mammal, and because the bacteria encounter different environments, we see a number of temperature-regulated genes. We also see six or

seven different iron-transport systems, and some of these are the key to *Yersinia pestis*'s growth and the growth of a number of other bacteria," Perry says.

Pathogens, disease-causing agents, need iron just like almost every other form of life, says Perry, who has published more than 40 articles on *Yersinia pestis*. "We have a lot of iron in our bodies, but most of it is inside our cells. What's outside our cells is bound-up by proteins, and part of the proteins' job is to withhold iron from invading pathogens," Perry says the different types of bacteria have all devised ways to remove iron from these iron-binding proteins.

One of these iron-transport systems, called yersinia-bactin (Ybt), produces siderophores—small molecules secreted into the environment to steal iron from the host's proteins and transport it back to feed the bacterial cell. The Ybt system is found in *Yersinia pestis*, other *Yersinia* species, and some strains of disease-causing *E. coli*. "The Ybt system is essential for the organism to grow in the early stages of the disease, when it's in the lymph nodes," Perry says. "Once it gets out into the bloodstream and spreads to the liver, spleen and other organs, another system called Yfe (*Yersinia*

iron) is important."

Because these iron-transport systems are essential to the bacteria's growth, they are potential targets for therapies, Perry says, and he points out that there is no licensed plague vaccine in the United States anymore. Although the last urban plague epidemic in the United States occurred in Los Angeles in the 1920s, an average of 10 to 15 human plague cases are reported each year, most often in rural areas of the West. About 14 percent of these cases are fatal.

Perry is collaborating in this work with Christopher Walsh at Harvard. "A lot of different enzymes are involved in siderophore synthesis, and these types of enzymes also make anti-bacterial compounds," Perry says. "Christopher Walsh is interested in taking a catalytic domain from one enzyme and hooking it up to a domain from another one. By doing that you can make a designer molecule that could have a toxic property for a bacterial cell."

A catalytic domain is a part of the enzymatic protein that carries out a biochemical reaction; and the enzymes Perry is working with often have five to 10 different catalytic domains, each responsible for carrying out a specific step in synthesis of the siderophore. Perry adds that some of the com-

pounds made by these types of enzymes also have anti-tumor activity, so scientists may be able to design the next generation of cancer drugs based on this fundamental research.

Perry plans to use his research professorship funding to support a continuing project focusing on how bacteria communicate with one another using what are called "quorum sensing systems," a name which reflects the need to determine if there are enough members of the group present to "conduct business."

"In pathogenesis this makes sense. You want to have a high enough population so if you start making a toxin, you have enough of your group there to create a toxic effect," he says. "If you start making a toxin when there are too few cells present, the concentration is too low, so the toxin doesn't really do the job. Also, you've tipped off the immune system."

Yersinia pestis has three different quorum sensing systems and Perry's group at UK (five people including assistant professor Jacqueline Fetherston, postdocs and technicians) will continue work to characterize the sensing systems and try to identify whether or not they control any genes that are important in causing plague.

—ALICIA P. GREGORY

JAMES BAKER HALL: KENTUCKY'S NEW POET LAUREATE

James Baker Hall, a highly respected teacher of writing at UK, is Kentucky's new ambassador of poetry. In a ceremony held April 24, Kentucky Writers' Day, Hall said he was "humbled" by two standing ovations in Frankfort's Capitol Rotunda. He added that he is "ready, willing and delighted" to be in a position to spread his passion for writing to people across Kentucky. Governor Paul Patton introduced Hall at the ceremony, saying that he "will bring to Kentucky writers the recognition they deserve."

As the new poet laureate, Hall received a two-year appointment with the mandate to promote and encourage participation in the literary arts in Kentucky. He feels there's been a great omission in arts education, in that students are taught about works of art but never get to talk to an artist. So Hall plans to push for a greater presence of artists in schools.

He also wants to bring to students a greater awareness of Kentucky's literary heritage. "I've become increasingly intrigued by the state of letters in Kentucky," says Hall. "There are a number of writers in the state with national and international reputations, dedicated authors whose work has been formed, at least in part, from living

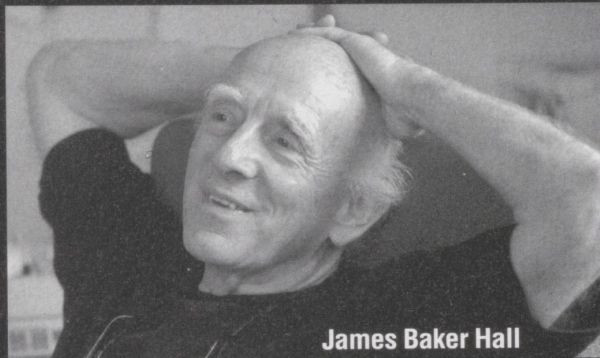
here. This is a story I'm looking forward to telling."

Hall sees an interconnectedness in his generation of writers from UK, many of whom have been friends for over 40 years—Wendell Berry, Ed McClanahan, Gurney Norman and Bobbie Ann Mason (who is, as of this fall, UK's first writer-in-residence). All but Mason went from UK to Stanford University and were awarded a Wallace Stegner Fellowship for emerging writers.

"Four of us in a row were out there on Stegner fellowships," Halls says. "First Wendell in 1959, then Gurney and me, then Ed. There never had been four Stegners coming from the same school. Not from Harvard or Yale or any of those big schools," he says with a characteristic grin.

Being the poet laureate of Kentucky, Hall says, is more about the pride of calling than the pride of place. "It's an opportunity to tell a story I strongly believe in. I want to help people understand that the art of poetry isn't limited to any state borders. I would hope that reading widely in literature would relieve people of the burden of provincialism."

Hall is pleased that the position of poet laureate is being taken seriously at the level of state government. The poet laureate does not receive a salary but is given \$5,000 for expenses, prima-



James Baker Hall

Stewart Bowman, The Courier-Journal

rily for travel to speak and meet with groups around the state.

"I think Jim's appointment is really quite wonderful," McClanahan says, "and from day one he's made himself a spokesman for Kentucky writing. It's also terrific that he's finally getting the recognition he's deserved all along."

Kentucky State University professor Richard Taylor, Hall's predecessor as poet laureate and longtime friend, says Hall is well suited for his new post. "He is dedicated to promoting creativity and coaxing good writing from his students," Taylor says.

"Jim's presence in the classroom—how he understands writing, how he gives to every student, his high expectations—all of this has changed my life. Not just my writing life, but my personal life as well," says Rebecca Howell, who has taken classes from Hall since 1996. "Jim's teaching prac-

tice is also a practice of compassion. I think you would be hard-pressed to find a former student of his who was not quick to say how much Jim genuinely cares about his students' well-being."

Hall, who has received a National Endowment for the Arts Fellowship in poetry, has taught creative writing at UK since 1973. He has published five volumes of poetry, two novels, and four collections of photography. *The New Yorker*, *The Paris Review*, *The American Poetry Review*, *Poetry*, *The Hudson Review*, and *The Kenyon Review* are among the many magazines to have published his work.

Hall's latest book of photographs, *A Spring-Fed Pond*, will be available this fall from Crystal Communications in Lexington (e-mail: crystalky@starband.net). The book features his photos of Kentucky writers, including his wife Mary Ann Taylor Hall, a novelist and short story writer.

—JEFF WORLEY

NUN STUDY IN NATIONAL SPOTLIGHT

The conversation was the type that happens almost inevitably with the person who happens to be seated next to you on an airplane.

"What do you do for a living?" asked the passenger seated next to David Snowdon, director of the Nun Study at the University of Kentucky Sanders-Brown Center on Aging.

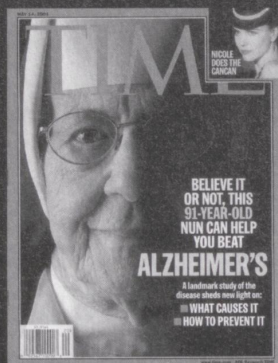
"I do Alzheimer's research," Snowdon replied.

"So what do you think of the Nun Study?" asked Snowdon's fellow passenger.

Unless you haven't seen or heard any news reports in recent months, you too probably have heard of the Nun Study. The study was on the front page of the May 7 *New York Times*, in *USA Today* on May 14, and was the cover story of the May 14 *Time* magazine. Stories also appeared on various national programs, including the Today Show, NBC Nightly News, and Fresh Air on National Public Radio.

The study, led by Snowdon, who is a professor of neurology in the UK College of Medicine, is in the national and international spotlight as a result of his new book, *Aging with Grace: What the Nun Study Teaches Us about Leading Longer, Healthier and More Meaningful Lives*. In the book, Snowdon offers a behind-the-scenes look at this landmark scientific study and the women who make it possible.

Since 1986, Snowdon has led an ongoing research program that is profoundly changing the



way we view aging and old age. Known as the Nun Study, the project involves 678 members of the School Sisters of Notre Dame religious congregation in seven convents across the United States. The sisters, who range in age from 75 to 106, have allowed unprecedented access to their personal and medical histories and undergo rigorous annual mental and physical testing.

Perhaps most remarkably, each nun also has pledged to donate her brain for Snowdon's research after she dies. With one of the largest pools of brain donors in the world, the Nun Study has yielded groundbreaking information about what we can do to help prevent Alzheimer's disease and live active, productive lives well into old age.

"Aging is not the cause of the health problems of old age," Snowdon writes. "Disease is the culprit." Through microscopic studies of the brains of those who have died, and through painstaking

assessments of genetics, education, lifestyle, diet, personality differences, and even the number of dental fillings a sister has, the Nun Study has offered up important clues to a longer, healthier life.

Both leading-edge science and a practical plan for prevention, *Aging with Grace* shows that old age does not mean an inevitable slide into illness and disability; rather it can be a time of promise and productivity, intellectual and spiritual vigor.

A leading expert on Alzheimer's disease, Snowdon

has presented his findings at scientific conferences throughout North America and Europe and has been published in major medical journals such as *The Journal of the American Medical Association* and *The Journal of Gerontology*.

Half of Snowdon's proceeds from *Aging with Grace* will be donated to the School Sisters of Notre Dame. The Nun Study is funded primarily through grants from the National Institute on Aging.

—VIKKI FRANKLIN,
CHANDLER MEDICAL
CENTER PUBLIC
RELATIONS



WITH JOSEPH STRALEY (PHYSICS AND ASTRONOMY), FOUR MEMBERS OF THE FIRST GRADUATING CLASS OF UK'S YOUNG WOMEN IN SCIENCE PROGRAM EXAMINE A DEVICE THAT USES MIRRORS TO MAKE A PLASTIC FLY AT THE BOTTOM LOOK LIKE IT IS FLOATING. THE PROGRAM, AT THE CENTER ON DRUG AND ALCOHOL RESEARCH, ENCOURAGES YOUNG WOMEN FROM APPALACHIA TO PURSUE SCIENTIFIC CAREERS IN DRUG ABUSE RESEARCH. PROGRAM PARTICIPANTS, SELECTED FROM 13 SOUTHEASTERN KENTUCKY COUNTIES, RECEIVE TRAINING, EDUCATION AND MENTORING OVER A THREE-YEAR PERIOD. LEFT TO RIGHT: MEGAN HOWARD, SAMANTHA PRATER, JESSICA CAUDILL, AND (SEATED) KRISTIN ADAMS.

ODYSSEY Fall 2001

PARTING SHOTS

"Computers are useless. They can only give you answers."

—Pablo Picasso

"The real problem is not whether machines think but whether men do."

—B.F. Skinner

"I do not fear computers. I fear the lack of them."

—Isaac Asimov

"Computer Science is no more about computers than astronomy is about telescopes."

—E.W. Dijkstra

"Hardware: The parts of a computer system that can be kicked."

—Unknown

"A computer lets you make more mistakes faster than any invention in history—with the possible exceptions of hand guns and tequila."

—Mitch Ratliffe

"Programming today is a race between software engineers striving to build bigger and better idiot-proof programs, and the Universe trying to produce bigger and better idiots. So far, the Universe is winning."

—Rich Cook

"For a list of all the ways technology has failed to improve the quality of life, please press three."

—Alice Kahn

"If computers get too powerful, we can organize them into a committee—that will do them in."

—Bradley's Bromide

"Imagine if every Thursday your shoes exploded if you tied them the usual way. This happens to us all the time with computers, and nobody thinks of complaining."

—Jeff Raskin

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*Foiled again: Subodh Das,
director of UK's Center
for Aluminum Technology,
see p.24*

Also Inside This Issue:

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Agriculture Heading? p.16

Living With Diabetes:

UK Research Offers New Hope, p.18

