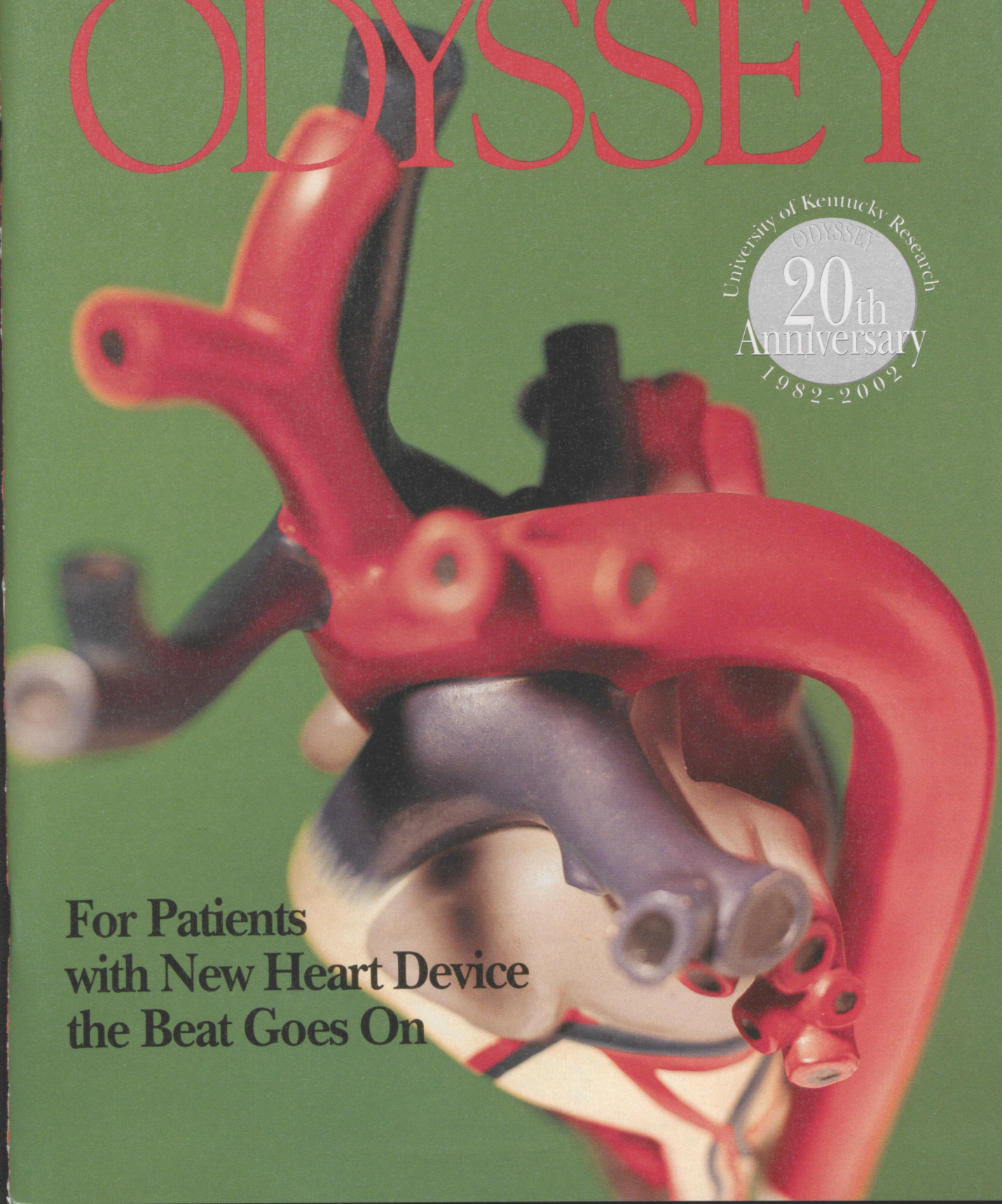


THE MAGAZINE OF UNIVERSITY OF KENTUCKY RESEARCH • SPRING 2002

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**For Patients
with New Heart Device
the Beat Goes On**



The Magazine of University of Kentucky Research

ODYSSEY

SPRING 2002



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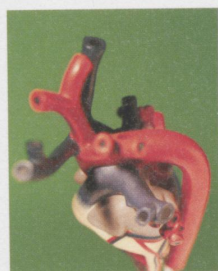
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*The world's first
medical monitor
for heart failure,
the Chronicle IHM
is allowing patients
to lead normal lives.
UK is one of only eight
centers across the
country approved to
implant the device.*

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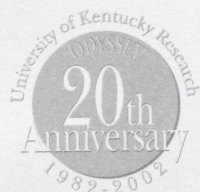
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ODYSSEY

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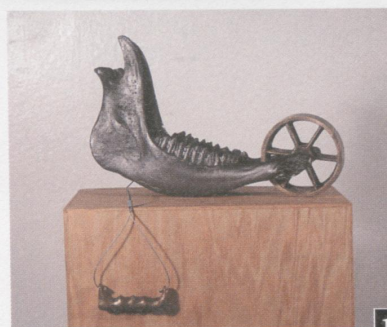
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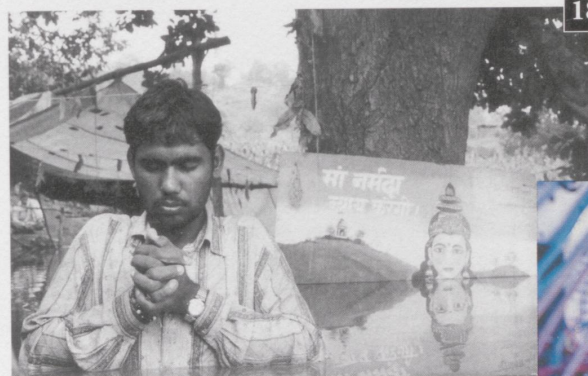
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For Patients with New Heart Device the Beat Goes On

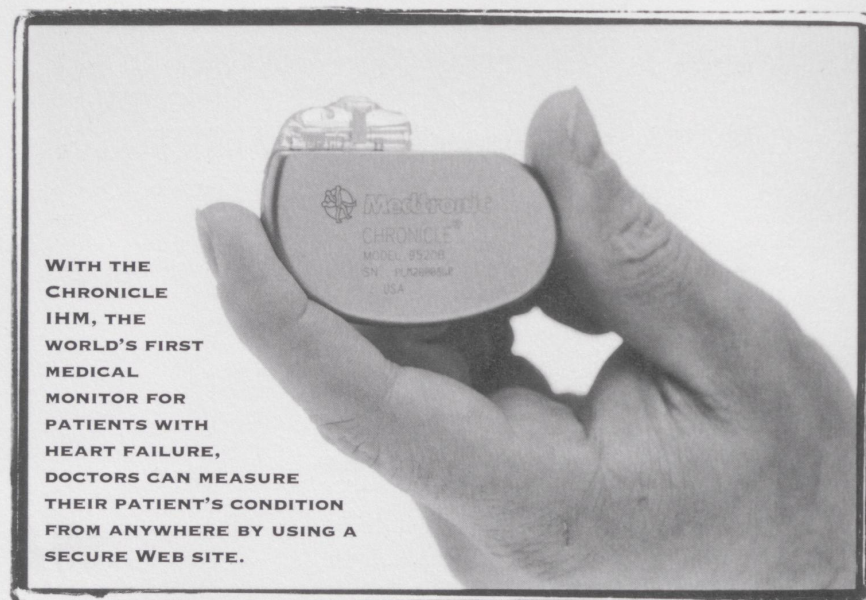
Susan Levy, a 62-year-old mother of five and grandmother of two, rang in 2002 in Vail, Colorado, celebrating with family and friends. Later that month, she flew to California to see her brother. When she is not traveling, Levy is likely to be found showing homes to a real-estate client, at the bridge table with friends, or at temple with her granddaughter. She has standing get-togethers with other groups of friends on Tuesdays, Wednesdays, and Fridays. Her life, she happily admits, is teeming with activity.

Just a year ago, however, life was dramatically different for Levy. She couldn't walk across a room without having difficulty breathing. She was tied to an oxygen tank and slept on a hospital bed at home to keep her head elevated enough so she could breathe. In short, she was not able to lead a normal life.

Levy had been diagnosed with heart failure, a diagnosis she shared with almost five million Americans, including an estimated 60,000 Kentuckians. In fact, over 400,000 new cases of heart failure are diagnosed each year, a 160 percent increase over the past two decades. This increase is due, ironically in part, to improved treatment of heart attacks, although longer life spans and diets high in fat also play a significant role in this increase.

Despite its name, heart failure is not a sudden stop in the heart's ability to keep beating. Rather, it is the heart's inability to pump powerfully enough to circulate oxygen-rich blood adequately throughout the body. Symptoms include shortness of breath, fatigue, and fluid accumulation.

Heart failure is the most common cause



of hospitalization for adults in the United States and is the only type of heart disease on the rise. The estimated cost of inpatient and outpatient care is \$56 billion a year. In Kentucky, heart disease is the leading cause of death among men and women, black and white, and in the United States about 250,000 people die of heart failure each year.

And for those who live, the impact of heart failure on the quality of life can be grim. The disease typically impairs physical functions and can lead to anxiety and depression.

Levy knows these facts all too well, but today these realities come to mind only when she has an occasional setback in her otherwise good condition. "I'm a healthy person," she says. "I don't even think of myself as sick."

The marked difference came from a new

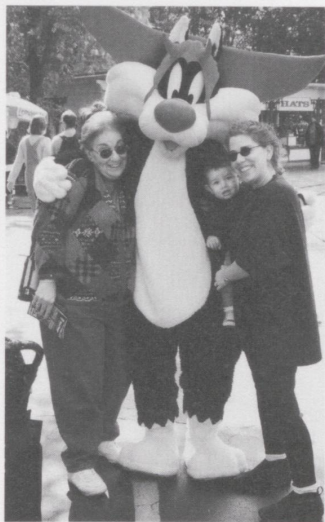
investigational device the size of a typical pacemaker known as the Chronicle Implantable Hemodynamic Monitor (Chronicle IHM, Medtronic Inc.). It is the world's first implanted monitor for the medical management of patients with heart failure.

Levy was one of the first two Kentuckians to have the device implanted in her chest and one of approximately 100 Chronicle IHM patients nationwide. The Linda and Jack Gill Heart Institute at the University of Kentucky is one of only eight centers across the country approved to implant the device, and the only site in Kentucky.

With the Chronicle IHM, physicians can monitor their patient's condition from anywhere by using the World Wide Web. The patient simply passes a magnetic device over



DENNIS McDONALD (FAR RIGHT) SAYS HE "GOT A LOT OF GOOD USE" OUT OF THE CHRONICLE IHM DEVICE BEFORE HIS RECENT HEART TRANSPLANT. HE IS PICTURED HERE AFTER HIS DAUGHTER AMY'S WEDDING. LEFT TO RIGHT ARE GRANDDAUGHTERS MEGHAN AND EMILY, HIS WIFE AGNES, AND HIS GRANDSONS JESSE AND TEDDY.



SUSAN LEVY (LEFT) WAS ONE OF THE FIRST TWO KENTUCKIANS TO HAVE THE CHRONICLE IHM IMPLANTED IN HER CHEST. SHE IS PICTURED HERE WITH HER DAUGHTER, CATHY WOLFSON, AND HER GRANDSON, ELI, AT SIX FLAGS GREAT AMERICA NEAR CHICAGO LAST OCTOBER, SIX WEEKS AFTER HAVING THE IMPLANT.

the implant, and electronic signals from the Chronicle IHM are transmitted over telephone lines to a Web site accessible only to the physician and his staff. The physician receives vital information about the patient's condition, including heart rate, body temperature, fluid levels, pulse, and, most importantly, the diastolic and systolic pressures in the heart—important measures of the heart's strength.

William T. Abraham, co-director of the Gill Heart Institute and chief of cardiovascular medicine, is the principal investigator for the study at UK and a member of the national committee overseeing development of the device. On August 22 of last year, Westby Fisher, a UK electrophysiologist, implanted the device in Levy and Wanda Moore. By the end of December, UK physicians had implanted the IHM in 13 more patients.

"This device has the potential to revolutionize the way we take care of patients," says Abraham. "The biggest advantage is that we can monitor remotely what is going on with the patient's heart. We can know how they are doing in another part of the state without having them go to an emergency room or drive to Lexington."

continued on page 5

More Heart Devices in Clinical Trials

The Chronicle IHM is not the only heart device undergoing clinical trials at the University of Kentucky Hospital. William T. Abraham says UK physicians are testing around 20 diagnostic or therapeutic devices and investigational drugs—all aimed at helping patients with heart failure.

Abraham led the U.S./Canadian trial of an implantable device known as Insync, and the FDA has now approved that device for general use. Similar in size and weight to a pacemaker, this device resynchronizes the beating of the patient's right and left ventricles—the heart's pumping chambers. This correction increases pumping power and improves cardiac output, thereby allowing blood to circulate throughout the body.

Abraham designed and organized the clinical trial for Insync, taking the device from concept to FDA approval. The clinical trial followed severely ill patients for almost two years. At the end of six months, 68 percent of patients were judged to be improved, and 33 percent who used the device were able to walk significantly longer distances.

"For many patients, that is the difference between performing almost no daily activities and performing some or all daily activities," Abraham said during a presentation at a medical conference last March.

Insync ICD, a second-generation Insync device, is also now in clinical trial at UK. Insync ICD not only resynchronizes the heart, but also incorporates defibrillator technology for patients prone to sudden cardiac arrest.

"Heart failure is a serious problem in Kentucky," notes Abraham. "Kentucky ranks first, second, or third in every measure when it comes to the prevalence of heart disease. These devices make it possible to treat more heart-failure patients. Our goal is for UK to become a prominent center for the treatment of heart failure."

Quicker Treatment for Heart Attack Victims

How do you know if you are having a heart attack? Do you know what to do when you are having symptoms?

Many people don't know and even those who do often delay seeking treatment, wasting valuable time that could save heart muscle or perhaps their life, according to Debra K. Moser, professor and Linda C. Gill chair of Cardiovascular Nursing in the College of Nursing.

Moser says that each year about one million Americans have an acute myocardial infarction, commonly known as a heart attack. Up to 45 percent of these people will die, 60 percent of them before they ever get to a hospital. But if they sought immediate treatment for their symptoms and received either thrombolytic therapy (also known as "clot-busting"), which uses an intravenous drug to dissolve the clot in the coronary artery that is stopping blood flow to the heart, or other therapies (including angioplasty or coronary artery bypass), the severity of the heart attack could be reduced, preventing irreversible damage and dysfunction.

Time is the enemy for someone who has had a heart attack. "The best outcomes are seen in patients who receive treatment within one to two hours of symptom onset," says Moser. "The problem is, most people wait between two to four hours before seeking treatment." In fact, only five percent of eligible patients receive thrombolytics within an hour and less than 25 percent receive any thrombolytic therapy at all. One-fourth to one-half of patients delay four hours before seeking treatment.

"When people experience pain, they typically try to think it away or wish it away," says Moser. "They try to relax or change positions. Some just pretend nothing is wrong, and others attribute it to more benign causes. Some try home remedies or take a Tylenol. When they do decide to seek treatment, many will drive themselves to the hospital."

Public information campaigns, including television commercials and print advertising, have had little impact on this problem, so Moser is hoping that their new program involving education and counseling intervention delivered by nurses will reduce the amount of time between the onset of symptoms and

treatment, ideally reducing it to under an hour.

In this program, nurses are following high-risk patients—typically those diagnosed with coronary artery disease, peripheral arterial disease, or clinical atherosclerotic disease—for 18 months. An advanced practice nurse meets with the patient in his or her home within a couple days after leaving the hospital. (This is the time when patients are most anxious and most likely to have problems following their physician's orders.) Nurses continue to monitor the patient with telephone calls and with further home visits if needed.

While there is certain information all patients receive, the meetings are individualized to meet each patient's needs. On average, patients have an hour of in-person intensive instruction followed by short phone calls, including discussions about typical symptoms, sessions in problem solving, and information on the potential benefits of acting quickly.

"By meeting individually with patients, we can respond to their concerns and questions," says Moser. "It is far more interactive and allows us to reinforce the information they receive in the hospital."

The goal for the study is two-fold, Moser says. Through this clinical trial, she hopes to decrease the delay time for patients seeking treatment and to increase use of emergency medical systems such as ambulances.

"The biggest part of the delay in getting appropriate treatment is not waiting for an ambulance or waiting to be treated once at the hospital," Moser notes. "The most

devastating delay comes from the patient not making a quick decision to seek treatment. If we can reduce this decision time, we can improve outcomes."

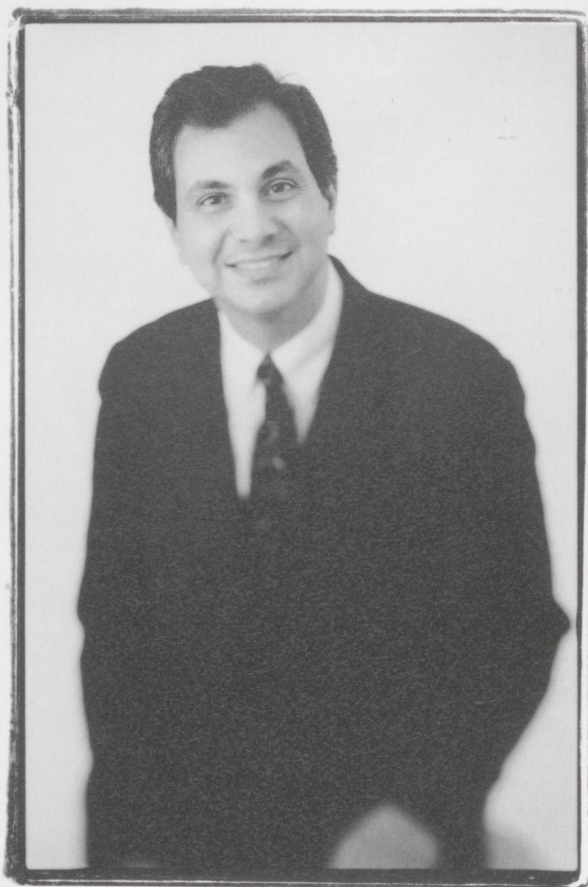
The UK program is part of a \$2.8 million National Institutes of Health five-year study to test the effectiveness of health-administered education at five sites around the world.



DEBRA MOSER SAYS THAT IF HEART ATTACK VICTIMS SEEK IMMEDIATE TREATMENT, THE SEVERITY OF THE ATTACK CAN BE REDUCED, PREVENTING IRREVERSIBLE DAMAGE.

UK's Reducing Treatment Delay for Heart Attack Symptoms program is accepting patients into the trial. If you have been diagnosed with heart disease and would like to participate, call toll free 866-570-8528. There is no cost to participate in the study.





**WILLIAM T. ABRAHAM, THE GILL FOUNDATION PROFESSOR
IN INTERVENTIONAL CARDIOLOGY**

The Chronicle IHM also greatly improves the physician's diagnostic capabilities. Making treatment decisions about heart patients is often difficult, Abraham says. "We may think patients are retaining too much fluid when they are really dehydrated. With this device, we know exactly what is going on with fluid levels and other critical measures."

Another patient and a pepperoni pizza gave the Chronicle IHM a good test.

"He called in not feeling well, and thanks to the device, we knew he had greatly elevated fluid levels," Abraham recalls. "We kept quizzing him about what he had done or eaten, but he denied doing anything out of the ordinary. We knew his numbers were not right, told him what medication to take, and his condition improved. Later he confessed that he had been anxious so he had eaten an entire pepperoni pizza. All that salt caused him to retain too much fluid."

Although she has no plans to eat an entire pizza in one sitting any time soon, Levy says she has had similar concerns.

"My symptoms are not always the same as other people's," she says. "Sometimes I appear to be dehydrated when I am actually

*"This device has the potential
to revolutionize the way we
take care of patients."*

—William T. Abraham

overloaded on fluids and need to get rid of water. This device tells my doctors what is happening. I haven't had to go to the hospital since I've had it. I don't think I would have survived without it."

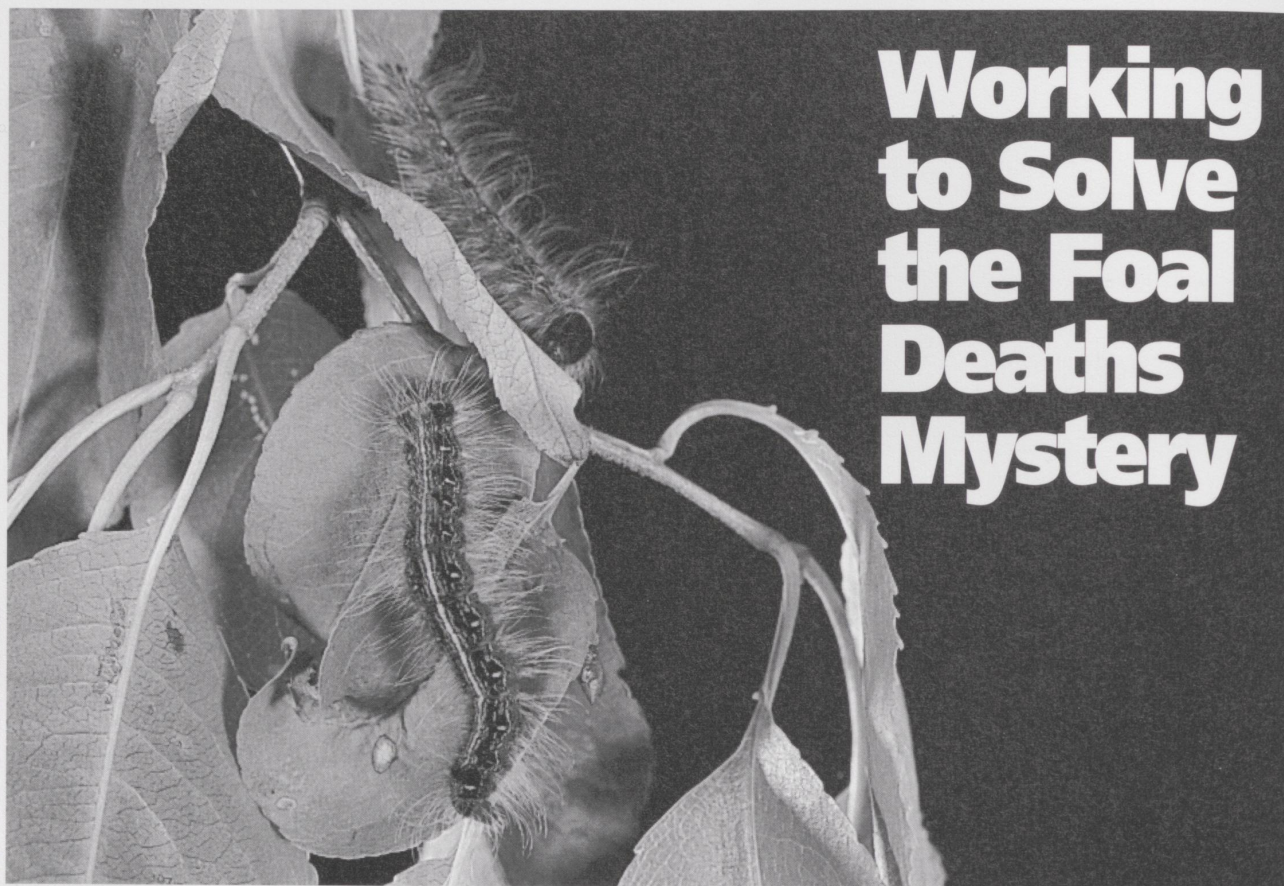
Levy was indeed disabled by heart failure, according to Abraham, but she was also a good candidate for the device because she has what cardiologists call moderate-to-severe heart failure. If her case had been mild, she could have probably been treated with medication alone. If she had been in end-stage heart failure, her probability for success with the device wouldn't have been good either, and she would have likely faced multiple hospitalizations.

Keeping patients out of the hospital will likely nullify the estimated \$10,000-\$12,000 the device will cost if and when it receives FDA approval. Abraham says that this cost would be about the equivalent of two typical hospital stays for a patient with heart failure.

Patients do not even need to be admitted to have the Chronicle IHM implanted. The one-hour surgery is an outpatient procedure during which the oval-shaped device is implanted just below the collarbone and a single wire is run to the heart. There is less than a one percent risk of infection from the implantation and minor risks of local bleeding, the only complications found thus far. No long-term complications have been discovered during the Phase II clinical trial; Abraham expects to begin Phase III trials this spring.

Perhaps the greatest benefit of the device is its potential to let patients lead normal lives again.

"They push me to have quality of life," Levy says of Abraham and her other physicians and nurses. "I'm basically having a wonderful life. If I have a problem, I call them, and they tell me what to do. The Chronicle has given me my life back. I can do anything I want to now. It has been a miracle." ■



Working to Solve the Foal Deaths Mystery

ALTHOUGH THE CATERPILLAR-CYANIDE THEORY HASN'T HELD UP IN RECENT LAB TESTS, THE EASTERN TENT CATERPILLAR'S ROLE IN THE FOAL DEATHS IS STILL BEING INVESTIGATED.

On Kentucky Derby Saturday, May 5, 2001, 73 dead foals and fetuses were delivered to the Livestock Disease Diagnostic Center at UK's Coldstream Research Campus on Newtown Pike. And while weekend deliveries of dead animals to the back door of the center is common, the tremendous number that day—about 10 times more than usual—was alarming.

"I knew we had big trouble on our hands. In addition to these foals and fetuses, we were aware that too many foals in the Fayette County area were being born weak," says Lenn Harrison, veterinarian and center director. Harrison worked alongside center pathologists practically non-stop that weekend—the first of many—to try to solve the puzzle of what was causing the death of so many foals and fetuses.

In the lab, pathologists performed a necropsy on each foal, looking at internal organs for signs of infection as well as taking blood and tissue samples for analysis. The tissue samples offered up the clue of rare bacterial infections in many aborted fetuses, but the pathologists concluded that these bacteria could not be solely responsible for the deaths. "As the necropsies continued, our belief got stronger that the bacteria were secondary to the specific cause of what was dubbed Mare Reproductive Loss Syndrome," Harrison says.

Within the next two days, the total number of dead foals and fetuses brought to the center grew to 276, and a team of over 100 experts from a variety of disciplines in the College of Agriculture joined the investigation. A group of highly experienced veterinarians made up a survey to be distributed right away to horse farms by the Kentucky Thoroughbred Farm Managers Club to try to determine the extent of the losses. Staff in the UK agricultural communications office also swung into action to make certain that the industry and the public were kept abreast of the situation. And a Web site, www.uky.edu/Agriculture/VetScience/mrls, was established to provide a continuing source of information for the public.

UK's magazine on research

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By May 10, news of the syndrome had spread around the world: U.S. networks as well as European and Middle East news agencies were constantly calling UK for information about this syndrome that had the potential to disrupt the global horse industry. Four days later, May 14, farm managers who had returned questionnaires confirmed the worst: the syndrome was widespread, and it was continuing.

"At this point, a couple of faculty members at Gluck [UK's Gluck Equine Research Center] recalled that in 1980 and 1981 early fetal loss had occurred spontaneously and no cause had ever been determined," Harrison says. "And in both years the losses abruptly stopped." Reported losses during those years, however, were nowhere near the 2001 numbers.

"A quick check of meteorological conditions then and now," he explains, "showed a disturbing similarity of weather patterns that could affect pastures where the mares grazed." March temperatures all three years were below normal, followed by above-normal temperatures in April. Such a pattern would result in explosive biological activity in both plants and insects. The data also showed frost or freeze in the third week of April, followed by warm temperatures a few days later. What impact could those factors have on the pastures?

"Although the convergence of weather factors in the three years with larger than usual abortion rates wasn't a smoking gun, it was suggestive that something weather-related was responsible," Harrison says.

Perhaps, he thought, weather-dependent vegetation could be linked to a variety of possible disease-causing agents, including mycotoxins and ergot-type alkaloids (which are derived from fungi and can be poisonous to animals in high concentrations) and phytoestrogens (compounds produced by plants that mimic the hormone estrogen).

Tests for poisoning from mycotoxins in feed, ergot-type alkaloids in pasture, and phytoestrogens appeared to be negative, but most of the tests were done after the syndrome had occurred.

Because none of the obvious causes appeared plausible, the scientists turned their attention to still another possibility—that the villain might be the Eastern tent caterpillar, whose populations were high in each of the years in question. Harrison showed UK agronomist Jimmy Henning some information he'd run across on these prolific crawlers, in particular the fact that they feed on wild cherry leaves.

And when Henning visited farms where mares had given birth to dead or dying foals or had aborted early-term fetuses, he discovered a striking pattern: most of the pastures had a large number of wild cherry trees. "I knew that cherry tree leaves carried the precursor to a poison—naturally occurring organic cyanide—that could cause death in horses and other animals, especially cattle," says Henning. "I also realized that Eastern tent caterpillars, which were known to feed on the leaves of cherry trees and were seemingly immune to the poison, had been quite active during late April."

The caterpillars became even stronger suspects in a meeting of veterinarians, farm managers and the media on May 24. "At that meeting," Harrison says, "several veterinarians confirmed that the incidence of early fetal losses as well as stillborn and dying foals had dramatically decreased during the previous week, paralleling the natural decline in caterpillar numbers."

The investigation into the possible role played by the caterpillars continued. In December 2001, entomology professor Bruce Webb made an interesting discovery: his research showed that cyanide does not accumulate in the caterpillars, so they are not likely to deliver appreciable amounts to

horses. This finding does not mean, however, that the caterpillars were necessarily innocent bystanders. Research planned by Webb this spring will investigate potential indirect roles that the caterpillars may play. "They produce large amounts of waste as they feed," Webb explains. "Much of this nutrient-rich material rains to the ground under infested trees and may serve as food for specific molds that produce toxins that might contribute to the syndrome."

As researchers close in on the causes of the foal-loss syndrome, the importance of their work is underscored by last spring's sad numbers. Between April 28 and May 12, 418 aborted equine fetuses and stillborn foals were brought to the Livestock Disease Diagnostic Center for evaluation. During that same period in 2000, only 60 fetuses and stillborn foals were received. On May 23, 2001, a University of Kentucky survey of 159 thoroughbred farm managers indicated that 678, or 21 percent, of 3,294 pregnant mares had experienced early fetal loss.

So, what can be done now and in the future to make certain that such an aberration doesn't occur again?

Henning says that researchers have begun a complex environmental monitoring system they hope will give them advanced warning if conditions are ripe for this to happen again. About 13 farms are being tested on a rotating basis, with soil, grass, water and other samples collected, analyzed, and stored for later comparison should foals again begin to die in such numbers. Weather patterns are also being closely tracked, and a massive research initiative on the causal mechanisms of the syndrome is planned by the College of Agriculture in the coming months.

Harrison says he hopes that the only thoroughbred problem he will have to deal with around Kentucky Derby time this year is which horse to bet on. ☐

For the latest information on the possible causes of Mare Reproductive Loss Syndrome, go to www.uky.edu/Agriculture/VetScience/mrls

Supercomputers

"R" Us Linking PCs for Unprecedented Power

WRITTEN BY
ALICIA P. GREGORY



In 1993, Hank Dietz and his graduate students at Purdue University decided to do some tinkering. They built a "cluster"—took four off-the-shelf personal computers, wired them together, and added their homemade network hardware to make a do-it-yourself supercomputer. By February 1994, the first generation of their special Linux PC cluster was born. It was cheap. It was fast. And they were first.

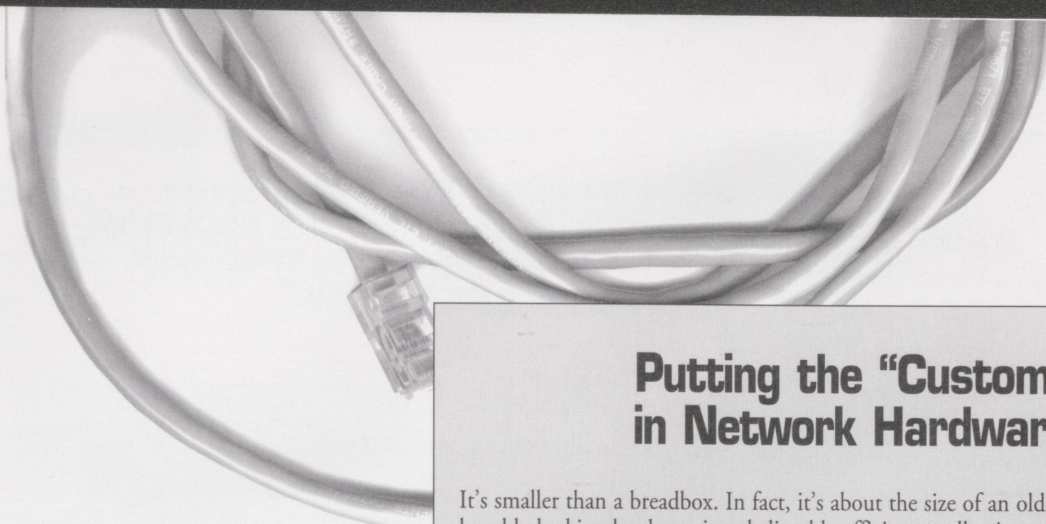
About half a year later, some other folks built their first cluster, named it 'Beowulf,' and went down in history as the creators of the Linux cluster.

The Purdue group had already built several clusters by that point, the largest of which was named "Spareparticus." So why didn't Spareparticus become synonymous with cheap, fast, computing clusters?

"Maybe it was the name," Dietz says with a shrug. "It just doesn't sound serious enough."

In any case, he never had any intention of treating Spareparticus as a serious computer. What began as an experiment to test what Dietz calls a "sneaky way" of performing certain kinds of communication within a parallel supercomputer (work his research group had been doing since 1987) turned into something much more.

RESEARCH ASSISTANT TIM MATTOX (LEFT), GRAD STUDENT GALEN RASCHE AND HANK DIETZ WITH THE TOOLS OF THEIR TRADE: A REAR-PROJECTION SCREEN, THE CLUSTER SUPERCOMPUTER KLAT2, AND A VIDEO WALL MADE UP OF STANDARD COMPUTER MONITORS.



Putting the "Custom" in Network Hardware

It's smaller than a breadbox. In fact, it's about the size of an old-style toaster. But this humble-looking hardware is unbelievably efficient at allowing a cluster of unmodified PCs to do the kind of processing once possible only on pricey supercomputers.

Named PAPERS (Purdue's Adapter for Parallel Execution and Rapid Synchronization) and created in 1994, Dietz's design uses a custom board that connects to PCs via their parallel ports—the same port on your desktop computer where you normally hook up a printer.

Why printer ports? Because the waiting period is about as short as you can get.

"If you just want to be able to get a little bit of data out of the machine as fast as possible, the parallel printer port is the way to go, because you can get something out in about one microsecond," Dietz says. That's faster than any other standard PC hardware—things like Ethernet interfaces take a while to get started sending data.

"Standard networking hardware is very good at sending a message from one processor to another, point-to-point. But if you want to ask questions like, 'Is everybody done yet?' or 'Who's done with their work so I can give them some more?'—the kind of questions that come up a lot in parallel programs—you can't answer very efficiently using point-to-point messages.

"Those are what we call aggregate questions—they require you to accumulate data from all of the processors." PAPERS—which has already gone through 19 generations and which Dietz describes as an "aggregate function network"—was specifically designed to do this.

"In a single operation, an aggregate function network collects data from everybody, reduces that data down to one piece of information (the answer to the question), and then returns that to everybody." He says if you tried to do this kind of thing with a traditional network, there'd be a whole flurry of communications that would slow the entire system down.

"Our network hardware is not commercially available from anybody at this time, which means we have to build the stuff ourselves," Dietz says. "But the good news is our designs are free, publicly available, and well documented on the Web."

Dietz's first acquaintance with the University of Kentucky was through Jim Lumpp, an associate professor in electrical and computer engineering. Lumpp was working on cloning Dietz's custom hardware for his own research about a year before Dietz came to UK.

Dietz says the real draw of UK was the fact that it sports both a top-notch engineering and medical school. "I got married two and a half years ago. My wife [Sabire Ozcan, a biochemistry researcher] was in a non-tenured faculty position at Washington University in St. Louis, I was tenured at Purdue in Indiana, and we were looking for a university where we could both work," he says. "There are very few universities that have good engineering and med schools right next to each other.

"On top of that, this is a university, and a state, that has a strong focus on building up computer engineering, and I liked that attitude." Dietz joined UK in July 1999 and a few months later was named the James F. Hardyman Chair in Networking. This chair is part of the Research Challenge Trust Fund program known as "Bucks for Brains," where the state matched, dollar-for-dollar, gifts by UK's major donors to endow chairs and professorships.

In 1993 his group had a breakthrough on how to implement his ideas in this custom hardware, [see sidebar at right], but they needed to build a mock-up to try it out. "So after a little bit of head-scratching, we realized that instead of building the machine from scratch the easiest way to build a prototype would be to take a bunch of PCs and tie them together with a very simple version of our custom stuff and use Ethernet to pass the messages between PCs," he says.

"Only after we actually built our first cluster we realized, 'Gee, this is working really well.'" And by "really well" Dietz means he was getting better performance from the shabby-looking cluster than he was getting from the million-dollar-plus supercomputer that sat next to it.

And since then Dietz, who came to the University of Kentucky in 1999, has had two goals: one, make it easier for anyone to build his own supercomputing cluster, and, two, create clusters capable of high-end processing for cutting-edge research.

Exploiting the Parallel

The concept of parallel processing can be boiled down to a need for speed. The best way to rev up a computer program is to divide it into multiple fragments that can run simultaneously, each on its own processor (that's the Pentium or Athlon chip, the brain of a PC). Intel's Pentium 4 or AMD's Athlon XP processors are based on the same idea. Inside those tiny chips of silicon, hundreds of things are happening simultaneously.

The same kind of parallelism is being

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If you have 64 machines working together on a problem and one of them is off doing something else rather than its part of the job, everybody's going to end up waiting for that guy."

—Hank Dietz

used to take complex computer programs into the world of day-to-day manufacturing. "Suddenly, you don't have to spend tens of millions of dollars to buy a supercomputer to run the fancy applications the top national labs have been working on for the past five to 10 years," Dietz says. In fact, for a mere \$40,000, you can build a cluster to solve mysteries like computational fluid dynamics (CFD), something engineers at Lexmark, the international company headquartered in Lexington, need to understand as they design the next generation of laser and inkjet printers.

"The complexity of those problems is not much different from the complexity of doing CFD modeling for the space shuttle. The budget is the big difference," Dietz says. Thomas Hauser, Ray LeBeau and George Huang, UK mechanical engineers who have worked on things like how to make printers quieter and how to make ink dry faster for Lexmark, have been using Dietz's clusters and are currently building a similar cluster dedicated to their research.

Dietz's work was initially funded by the Office of Naval Research, he's won grants from NSF and NASA, and has received donated equipment and funds from a number of corporate sponsors such as AMD, Intel, IBM, and Texas Instruments.

His focus can be summed up in three words: whole system design. And this focus is evident in the name he gave the UK research group: KAOS. This is not only a Kentuckyfied spelling of CHAOS (which stands for the three basic components of a cluster: compilers, hardware architectures, and operating systems), but also a reference to the old "Get Smart" TV series, in which KAOS was the organization fighting against CONTROL.

"This strange name gives a feel that, in some sense, this is a chaotic field. We're looking at how a lot of different things

interact and that, by its own nature, is a complicated problem," he says. "A lot of people are building clusters, but we're just about the only ones who are looking at compilers, operating systems, and the hardware—even building our own custom hardware—all as one problem."

For those of you who don't speak geek, a compiler is what translates programs written in source code (human-readable language) into object code (language the machine can understand). "You write code in PASCAL, Java, C, C++, FORTRAN, then you run that code through a compiler and it generates what actually runs on the machine," Dietz explains. Instead of focusing on writing the world's best compiler for one programming language, Dietz's team built tools so that anyone can build customized compilers. These tools, known as the Purdue Compiler Construction Tool Set or PCCTS, have been used all over the globe by people in industry and academia.

Dietz's focus on hardware architectures is pretty straightforward. "Hardware is the stuff you can touch. What we're looking at is how the different components are put together to build a cluster."

The operating system of choice for most computer scientists is Linux, primarily because it's "open sourced," which means you can modify the source code. (With operating systems like Windows you don't have access to the source code—all you get is the object code, the stuff only the machine understands).

"We use Linux because it's tuned for giving you peak performance with just a handful of things running on the machine at a time," Dietz says. "Linux was intended primarily for use on a personal computer, because if you're running a program, you want that to take priority over everything else. But the reason it's good for us is when you're running a parallel program across a whole bunch of machines you don't want

any other crud getting in the way.

"Think of it like this: If you have 64 machines working together on a problem and one of them is off doing something else rather than its part of the job, everybody's going to end up waiting for that guy."

A Groundbreaking Cluster

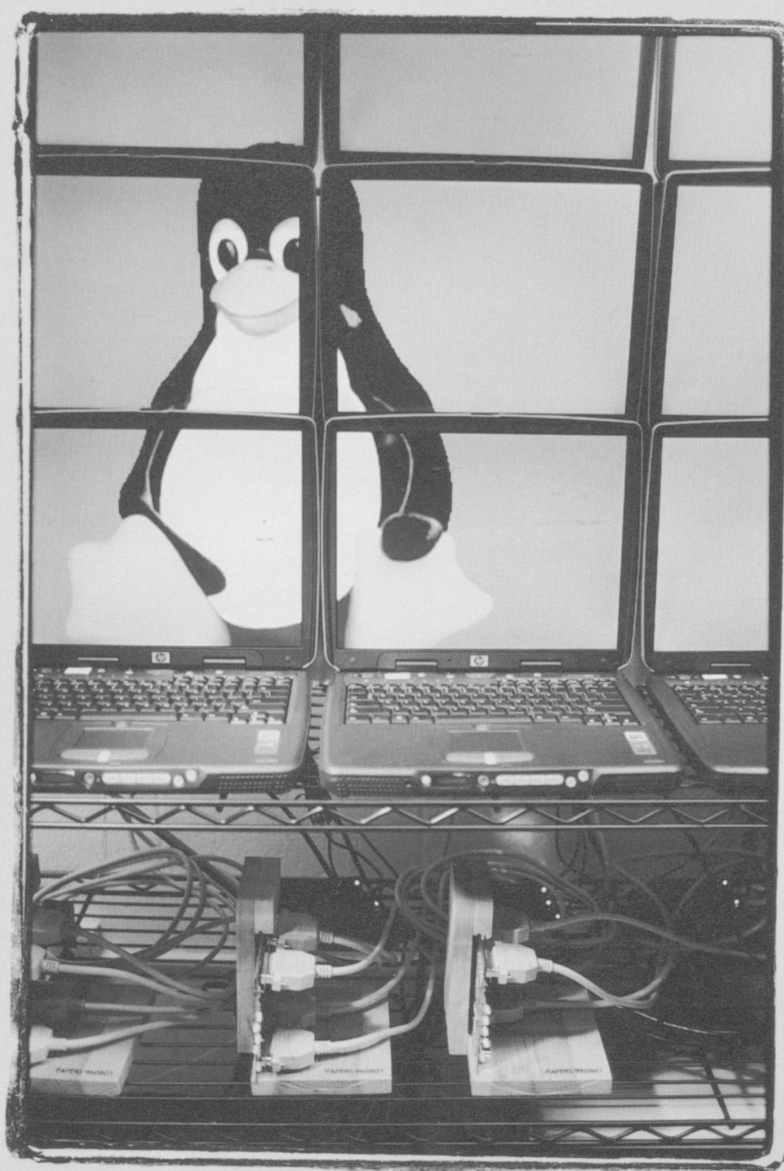
KAOS's credo: while using the most economical parts possible, get the peak performance out of a computer application by "tuning" a cluster so that all of the parts work in perfect harmony. In April 2000, with the help of more than 30 UK students led by Tim Mattox (a research assistant who has been working with Dietz since the days of Spareparticus), Dietz built a cluster that is the poster-child for this concept.

Its name: KLAT2 (Kentucky Linux Athlon Testbed 2). It's an intimidating machine purely on the basis of numbers. KLAT2 is 64 PCs (plus two "hot spares"—back-ups that can be swapped in if one of the 64 fails). Each of the PCs (a.k.a. nodes) has four network interface cards (NICs), the standard for Ethernet connectivity. KLAT2 has nine 32-way switches and nine different colors of wires.

"In order to have a cluster work well as a single machine, all of the nodes need to be able to communicate very efficiently. Part of that is having very low latency (a brief delay in communications), and part of it is having very high bandwidth (being able to send a lot of data through at a time)," Dietz says.

The ideal way to connect machines is to tie them directly to each another. "But when you have a large number of machines, the number of wires involved makes that infeasible almost immediately, so you have to start thinking about a network structure that has at least one switch between the machines," he says. "A switch is nothing more than a box that a bunch of machines can be wired to so that any machine plugged into that box can talk to any other machine, and they can all be talking

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DIETZ'S LAPTOP VIDEO WALL DISPLAYS AN IMAGE OF TUX, THE LINUX MASCOT. HIS CUSTOM NETWORK HARDWARE (BOTTOM) USES PARALLEL PRINTER PORTS TO SYNCHRONIZE THE NINE LAPTOPS.

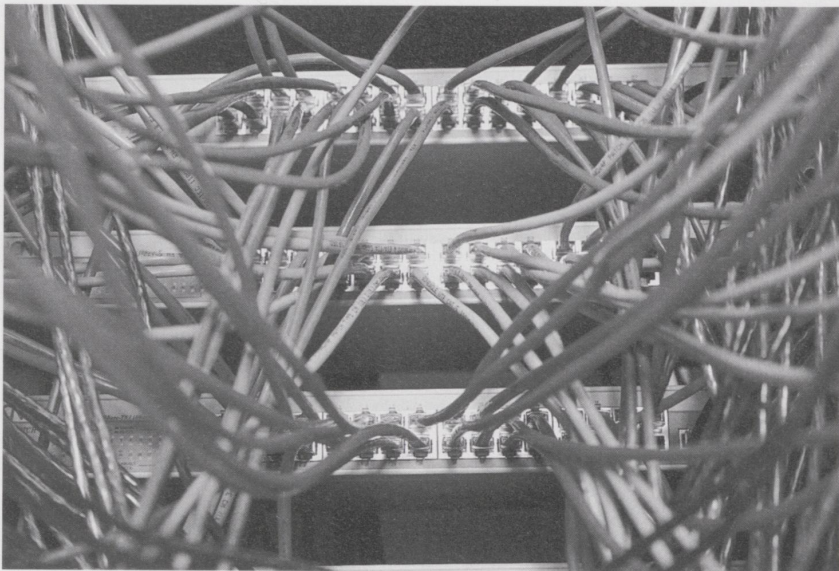
Show Me the Pictures

Something that started as a way to show just how fast his custom hardware can perform aggregate operations has become one of the big draws at research exhibitions: video walls.

Dietz's lab features a 16-PC video wall using standard computer monitors. The PCs were donated by AMD, the second-largest supplier of PC processors in the world. "This machine is actually a parallel supercomputer that does a lot of processing on data in addition to display processing. That allows you to do computationally demanding things like simultaneously pan and zoom," he says.

Dietz's video wall of nine laptops at last year's supercomputing conference in Denver drew much more attention than the nine video projectors that made a 7.5 by 10 foot rear-screen projection display. (Both were displaying a computer simulation of fluid flow around a turbine blade.) "Other people had rear-screen projection, but nobody was stupid enough to bring a cluster of laptops," he laughs.

"And the really scary part was our laptop cluster was the highest-resolution video wall at the show." Through some special technology known as "sub-pixel rendering," Dietz's laptop wall showed a much clearer, more detailed picture than anything else at the conference. The video wall library software created by Dietz's group and released as public domain isn't the most powerful video wall software available, he says, but it does make it easy for almost any application to use the video wall, without rewriting any code.



KLAT2 RELIES ON THESE FAST ETHERNET SWITCHES TO PASS MESSAGES AMONG PCs.

simultaneously.”

The normal way, he says, to connect a cluster of PCs is by building a hierarchy of switches—every machine plugs into a switch, and the switches plug into another switch, with the result that a message has to go through three switches to get from one machine to another. But that’s a sluggish solution, and Dietz and his team chose to think outside the box.

“We realized that the optimal network would have any pair of PCs able to communicate with only a single-switch latency and full bandwidth,” he says. “But who said it had to be the same switch for all pairs of PCs? So you realize, Ah! It’s cheap to put multiple network interface cards in each machine, and what we can do is plug each of those NICs into a different network switch in such a way that the wiring pattern guarantees that any pair of PCs has at least one switch in common.” Dietz calls this

concept a “Flat Neighborhood Network,” because there is only one level of switches.

When KLAT2 was built, the latest-greatest word in network speed was gigabit technology (which can transfer data at a rate of one billion bits per second). But the cost was prohibitive.

A year-and-a-half ago, NICs for gigabit hardware ranged from \$320 to \$1,500 (today the cheapest ones are \$50) and gigabit switches were very expensive. With four NICs per PC, you can see why gigabit wasn’t the economical way to go. “Fast Ethernet—100 megabits per second—is really, really cheap,” Dietz says. “NICs cost about 10 bucks apiece.” And when it came to switches, cost was also the deciding factor: “Thirty-two-way fast Ethernet switches were cheap.”

But one question remained: What was the best way to create a blueprint to show how to hook up this 264-wire beast?

Let a computer figure it out. So they did.

Natural Selection Creates a Cluster

KLAT2 was the first machine ever built with a network designed by computer, and the application that concocted the groundbreaking wiring scheme is known as a genetic search algorithm. These kinds of algorithms aren’t new. They’ve been around for over a decade, Dietz says, used mostly to solve straightforward mathematical problems.

“Genetic search algorithms do the same kind of thing natural selection does,” Dietz says. “We set up a ‘population’ of different network designs (interconnection patterns) and the program evaluates them based on this question: ‘Can every machine talk to every other machine?’ If they can’t, that pattern is thrown out.”

The search algorithm then takes the attributes of the good wiring patterns and mixes them up a little to see if the resulting designs are more efficient. “So now the question is, ‘How do two wiring patterns have sex with each other?’ (We call it crossover.) We’ve written into the algorithm a very simple way of taking subsets of the wiring patterns and exchanging them (like gene sequences in human DNA). It’s a little devious, and I believe we’re the first ones to do that with a genetic search algorithm.”

By repeating this exchange over many “generations,” Dietz’s algorithm evolved a wiring pattern for KLAT2. But it took an incredibly powerful computer to do this. Dietz just happened to have several such computers: the other clusters in his lab.

“The computing power it took to run the genetic search algorithm was more than most people would have been able to invest in it, so, in some sense, having our older clusters was the enabling technology for building this one,” he says.

At the time KLAT2 was built, it cost \$41,000. Today it would cost about \$25,000. “And at the time KLAT2 was

created, it was the first general-purpose supercomputer to achieve better than one gigaflop [one billion floating-point operations per second—the basic measurement of computing performance] per \$1,000 spent on the machine,” Dietz says.

In fact, KLAT2’s price-performance ratio was \$650 per gigaflop. (Traditional supercomputers were closer to \$10,000 per gigaflop, and most Beowulf clusters were around \$3,000 per gigaflop.)

The machine drew praise from the computing community. The technologies developed and demonstrated in KLAT2 were recognized by *Computerworld* magazine as one of the six most significant contributions of information technology to the advancement of science in 2001, and earned an honorable mention in the price-performance category of the 2000 Gordon Bell Awards. (“These are the closest thing to a Nobel Prize in supercomputing,” Dietz says. “They give out zero to six awards each year, so it’s a big deal.”)

There are several clones of KLAT2 based on the Flat Neighborhood Network concept. Last summer Mattox flew to Keele University in England to help researchers set one up to do environmental geophysics modeling. Dietz and Mattox are currently working with Tim Dowling at the University of Louisville to set up a slightly smaller version (with 40 PCs) to do planetary weather modeling.

Dedicated lab equipment. That’s what Dietz sees as the future of his supercomputing clusters. “We want to find a handful of very important applications that lots and lots of people would like to have available to them and, essentially, beat those applications to death in terms of making them as efficient as possible,” he says. This would mean rewriting the code to take the best advantage of parallel processing, something that, over the years, he’s developed a fairly large bag of tricks to help him do.

“We want to come up with a cookbook-

like design mechanism for building the clusters and essentially put that out as full public domain so anybody can take that set of design specs and either build it themselves or have somebody build it for them. The goal is that they’ll not even realize it’s a computer—it’ll just be a funny-looking piece of lab equipment.”

The Right Tool for the Job

Dietz unveiled an innovative tool, “The Aggregate Cluster Design Rules,” at the Supercomputing 2001 conference in Denver last November. This Web-based form allows users to input very specific information on the application they want to run and the desired components, including their cost, and it spits out the best possible network designs for a cluster.

It does an exhaustive search: when Dietz filled out the form as an example, it searched 57 million different cluster designs. Of those, a mere 3.5 million were viable solutions. It then ranked those 3.5 million according to efficiency. “You can win arguments with people: ‘Why is this a good design?’ ‘Here’s why.’ It gives you specs on every aspect of the cluster and lets you do side-by-side comparisons of the designs.”

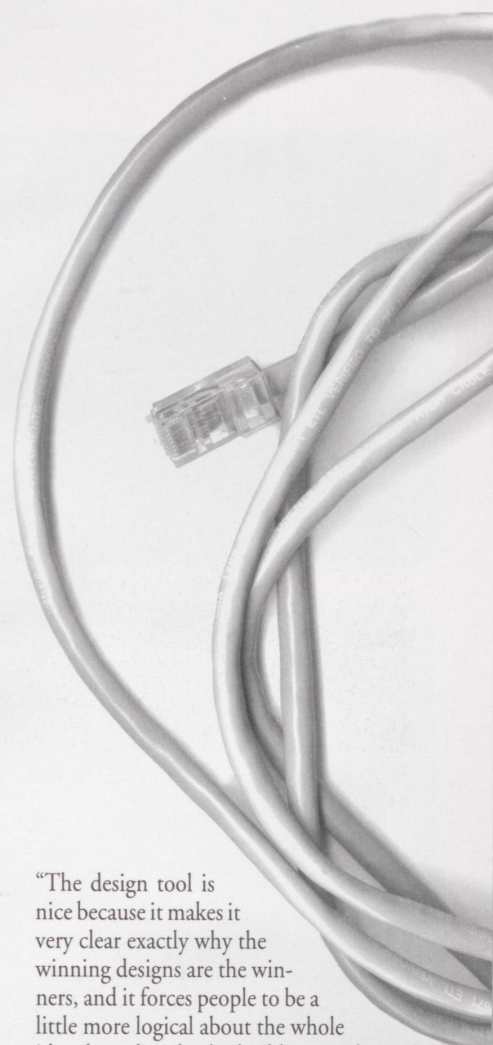
Built into this tool are many of the tricks Dietz has picked up in seven years of designing clusters, and, while he says it can’t build the cluster for you, it offers a realistic starting point for someone in the know who wants to make their own cluster and who takes about 10 minutes to fill out the form.

“The standard way people have been told to build clusters is to go out and buy the best components they can afford, throw them together using the best networking hardware they can afford, and wah-la. They’ll have a system that works perfectly and within a day they’ll be running their code on it.

“It doesn’t work that way.” You don’t need the most expensive stuff out there, but you do need some common sense, he says.

“The design tool is nice because it makes it very clear exactly why the winning designs are the winners, and it forces people to be a little more logical about the whole idea that what they’re building needs to be designed as a cluster supercomputer, not just thrown together and cross-your-fingers.”

Dietz says a number of computer vendors who saw this tool at the conference can’t wait to put a version on their own Web sites, customized with their components and current prices, and Dietz is more than happy to let them do it. Money isn’t the issue for him. He’s investing in the future of computing by designing cheap solutions to complex problems. ■



Fired-Up for Their Art



PROFESSORS GARRY BIBBS AND JACK GRON

It's a chilly mid-November evening in UK's open-air metal arts studio, but the assembled group—teachers and students—don't seem to notice. This is because they're outfitted with heavy leather foundry jackets, thick leather aprons, fireproof gloves, and leather boots. With screen mesh drawn over their faces, silver helmets and plastic visors, they look a bit like moon walkers, or a special fire-fighting unit.

But they're not fighting fire; they're using it to make art.

At this yearly iron pour event, the artists are standing at a respectful distance from the blackened, five-foot-tall steel furnace. For two hours, it's been cooking a concoction of coal (called coke), recycled iron and crushed limestone. The furnace volcanoes up a plume of yellow-gold flame, takes a breath, then bellows up another. The furnace is loud, so loud that if you close your eyes for a second you can imagine it's a small jet plane, gunning for takeoff a few feet away.

As the coke burns, superheated by a charge from a blower through an interior chamber, it melts the limestone and iron. The melting iron

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

runs to the well at the bottom and, now that the temperature of the mixture has reached 2700° F, it is ready to be poured.

Art instructor Brad Connell and undergraduate Molly Moran approach the furnace with a ladle—a seven-foot-long metal shank with a bucket (“vessel”) welded to its center. They place the preheated ladle under the tap hole near the bottom of the furnace, another student uses a tap spike to knock out the plug (or “bott” in the lingo of the sculptor), and liquid iron rushes into the vessel.

“The ladle, when full, weighs about 200 pounds,” Molly says, “which means you not only have to have some body strength and good sense of balance, you also have to trust your partner in this process.”

Brad and Molly maneuver the ladle over a mold, Brad turns the two handles on the “live end” of the ladle, and the iron sloshes into the mold.

“This dance with molten iron is probably the most dramatic thing we do in the metal-casting process,” says Jack Gron, an associate professor of fine arts and chairman of the Department of Art at the University of Kentucky. “But it’s only one step in what is surely the most process-intensive of all the arts.”

In fact, the finished sculpture—whether iron, aluminum, or bronze—that you see in an exhibit or gallery is the result of dozens of steps, beginning with an idea. “Unless you’ve made a piece yourself or have been a student of the art, there’s no way you realize just what it takes to get to the finished sculpture,” Gron says. He stresses that each student’s finished work is just *one* piece, adding that many sculptures consist of dozens of various kinds of forms, sometimes different materials, that make up the finished work of art. “In this process, patience is one of many tools the metal sculptor can’t do without,” Gron says.

“In the casting process, you might live with one image you’re trying to build for a year or more,” says Garry Bibbs, also an associate professor in the department. “You model something in clay first, take the mold off, transfer what was in the mold to wax, then burn out the mold to leave empty cavities, and so on. There are lots of steps; it’s very process-oriented.”

Because Bibbs doesn’t like “living with one form too long,” as he puts it, he takes another approach. “What I do is called direct metal work,” he explains, “which is based on a pattern: you start with pencil-and-paper drawings, go to cardboard templates, and then transfer the cardboard images into metal, bending these forms and

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LINING UP SAND MOLDS FOR THE IRON POUR



POURING MOLTEN IRON IN RESIN SAND MOLDS



JERRY MASSE (LEFT) SKIMS SLAG FROM THE TOP OF THE MOLTEN IRON TO KEEP IMPURITIES OUT OF THE MOLD.

Fired-Up for Their Art

filling all the gaps." Bibbs's *métier* is working with stainless steel.

Since returning to UK in 1990 from Chicago's Black on Black Love Art Cultural Center, five years after he earned an MFA here, Bibbs has created dozens of steel sculptures. One of his artworks, a commissioned piece called "Life Family and Good Health," has graced a small, landscaped area outside of the Kentucky Clinic on South Limestone Street since 1992. This sculpture, made only of stainless steel, measures 16 feet by six feet by four feet.

Gron describes the Metal Arts Building where he and Bibbs and their students work, and the much larger Reynolds Building adjacent to it, as "fantastic, old, dusty buildings in marvelous disrepair." The Reynolds Building contains over 100,000 square feet of space, and Gron adds that their off-campus location (three blocks from the edge of campus) seems to suit everyone just fine.

Gron, a bearish man, is unassuming, direct, and funny. His abridged curriculum vitae, listing research, solo exhibitions, selected group exhibitions, major commissions, and grants, runs five pages. He's exhibited his art in galleries and at universities across the country and has been an artist-in-residence in England and Poland. Last year he became the first American sculptor to be included in the permanent collection at the Ironbridge Open Air Museum of Steel Sculpture in Coalbrookdale, England. And the energy and enthusiasm he brings to his art spill over into his teaching.

"Jack as both an artist and a teacher is a role model," says Molly, who completed her BFA here in art last semester. Brad, who finished his MFA in sculpture at UK last spring and is now working as a part-time faculty



TERESA KOESTER, A GRADUATE ASSISTANT IN ART, PREPARES A RESIN SAND MOLD.



JACK GRON (LEFT) WITH PROFESSOR MEREDITH JACK, A VISITING ARTIST FROM LAMAR UNIVERSITY IN BEAUMONT, TEXAS, AND JEFF UNDERWOOD, AN MFA ALUMNUS OF THE UK PROGRAM

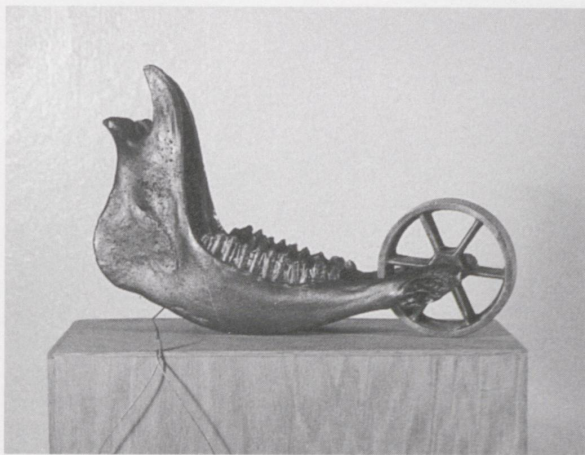
member in the department, says, "Jack is excellent at encouraging people to do what they want to do, then letting them go with it. I'd characterize his teaching style as 'minimal direction with maximum help.'"

Gron and Bibbs are almost singularly responsible for attracting many undergraduates and graduate students to the program. For example, one student new to the program, Isaac Duncan III, credits Bibbs for enticing him here. "I knew of Professor Bibbs and his work through a mentor we shared—the renowned sculptor Richard Hunt. He gave me a studio to work in when I was recently in Michigan," says Duncan, who worked as an artist and also taught art in an elementary school before coming to UK. "Hunt put the bug in my ear about UK, and when I visited here I found that the facilities were great—not only a foundry but also a good fabrication facility."

Duncan, who received a fellowship in his first year at UK, says that one unique aspect

of the metal sculpture program here is the focus on the technical side of making things. "In contrast to some programs that are more conceptually based, UK's art department is rooted in the tradition of creating pieces that are form based: the tangible end-product—and how you get to it—is what's most important," he says.

Bibbs and Gron are pleased to have "furthered along," as Bibbs puts it, dozens of students over the years. "Quite a few of our BFA



"TOY," CAST IRON AND BRONZE, 15" x 12" x 5" IS ONE OF SEVERAL PIECES MOLLY MORAN INCLUDED IN HER RECENT EXHIBITION AT UK. SHE RECEIVED A BACHELOR OF FINE ARTS DEGREE EARLIER THIS YEAR.

graduates have gone on to the most prestigious graduate schools in the country," Gron says. "Cranbrook Academy, the Rhinehart School of Sculpture, Syracuse University, the Art Institute of Chicago, the San Francisco Art Institute, to name just a few." And several of these former students now have national and international reputations as metal sculptors, designers, and consultants, he adds.

"Jack and I are working artists ourselves, and we're helping to produce new artists," says Bibbs. "I believe this is a serious contribution to society—what we're all about is helping to foster and preserve the human instinct to create. My whole purpose is to help to register who we are as humans on this earth."

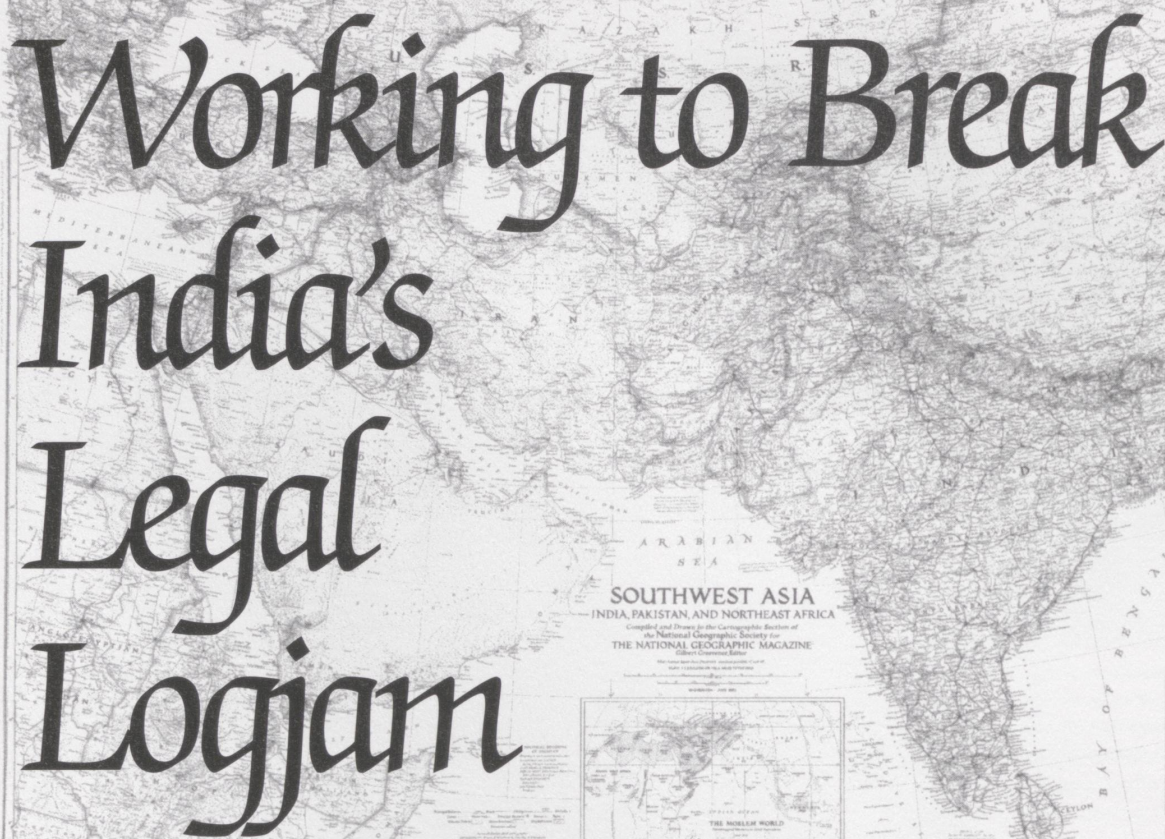
Gron, who has been at UK for 19 years, says he's proud to be heading up the largest sculpture program in the state and one of the largest in the region. "I want our program here to prepare students for their next step in life. It's all about hard work, about getting students to be creative with their hands and their minds." ■



ISAAC DUNCAN, A GRADUATE STUDENT IN THE MFA PROGRAM, WITH A RECENT, AS-YET UNNAMED WORK HE MADE USING STAINLESS STEEL. "THIS PIECE IS BASED ON FORMS AND HOW FORMS INTERACT," HE SAYS. "I LIKE TO WORK WITH THE ILLUSION OF MOVEMENT. BY PLACING CERTAIN FORMS AT DIFFERENT ANGLES, I CHALLENGE WEIGHT AND GRAVITY."

WRITTEN BY
JEFF WORLEY

Working to Break India's Legal Logjam



For half a century in India, progress and technology have worked together to devastate the lives of millions of people. That's a strong statement all right, and it does need some qualification. Specifically, it's been the building of dams throughout the country that has resulted in people being forced to leave their homes and relocate when lakes rise behind the newly built dams and flood ancestral villages out of existence.

"Dams have been built at a prodigious rate for over 50 years to improve India's irrigation system," says John Stempel, director of UK's Patterson School of Diplomacy and International Commerce. "The problem is, there's never been a mechanism for checking out environmental consequences. So when one of these towering structures

'fills up,' people have to flee."

How many people? Millions. Arundhati Roy, in an essay titled "The Greater Common Good," puts the number at 33 million people displaced by big dams alone in the last 50 years. Roy, author of the best-selling novel *The God of Small Things*, uses statistics from a detailed study of 54 large dams done by the Indian Institute of Public Administration to arrive at this number.

Along with their displacement, Stempel says, a lot of "political fuss" results. The court system in India continues to be deluged with environmental cases—the flooding of dams being just one of many—in large part because environmental regulations have been slow in coming, he says. Even though "fast-track" developing coun-

tries like India have adopted the same kinds of environmental regs that the United States has in place, these U.S. laws have evolved over a 35-year time period, allowing our legal system the opportunity to evolve with them. In India, on the other hand, the print is scarcely dry on enacted environmental regulations; most have been in place no longer than five years.

The result? Legal wrangles have hit their own dam-like barriers, leading to nothing but a thundering stalemate. Since 1996, for example, the State Supreme Court in Tamilnadu has been working to resolve lawsuits that pit environmentalist groups against various government agencies. A year ago, the court had a backlog of 216 cases.

"Out of these 216 cases, the court has, so

far, resolved five—just five,” says Stempel, who served as U.S. Consul General for South India at Madras for three years before coming to UK. “And not one of these was resolved by prior trial agreement—we’re talking zero out-of-court settlements.” Since up to 85 percent of civil cases are resolved in India through agreement outside of the courtroom, the obvious question is, How are these environmental cases different?

“The short answer is that these cases are expensive, very complex, and emotionally charged,” Stempel says. “After the case grinds through the lower courts, there are two likely litigated outcomes. The state could win and the decision would be appealed. Or the environmental group could win and the decision would be appealed. When the dust settles, the two sides see that they were merely fighting over whose name would appear at the top of the next court filing.”

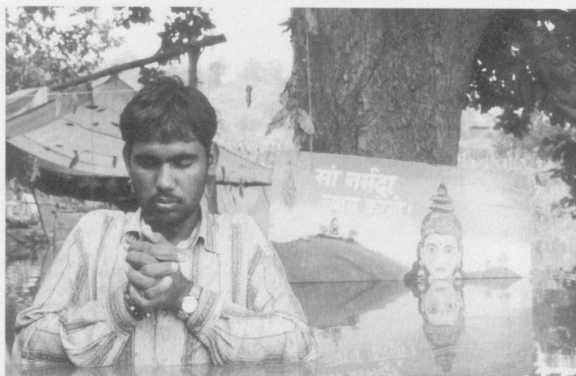
Alternative Dispute Resolution

Stempel’s interest in all this follows not only from his stint in southern India as consul general; he also has a strong interest in an ameliorating policy called alternative dispute resolution, or ADR. “With ADR, instead of worrying about the legal case, you just call both sides together, get them in a room, and talk about what’s best for both parties. You’re not trying to make points through a lawyer; you’re trying to find out exactly what both sides can agree to live with,” Stempel explains. “I like to call ADR ‘diplomacy made safe for lawyers.’”

Patterson School involvement in this judiciary impasse in India resulted from a phone call to Stempel from Albert C. Harberson, manager of the National Institute for State Conflict Management at the Council on State Governments, located in Lexington. “We had identified a couple of grants that we were interested in applying for,” says Harberson, who has worked with mediation systems at both the state and federal levels.

“Out of the
216 cases, the
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—John Stempel



IN INDIA WHEN LAKES RISE BEHIND NEWLY BUILT DAMS, ANCESTRAL VILLAGES ARE FLOODED OUT OF EXISTENCE. THE POSTER, A PAINTING OF THE GODDESS NARMADA, WAS PUT UP CEREMONIOUSLY BY THE PEOPLE OF THE JASINDHI VILLAGE. THE CAPTION READS, “MOTHER NARMADA WILL GIVE US JUSTICE.” [PHOTO BY HARIKRISHNA]

“We saw one that focused on India and some problems they were having in adjudicating cases in their court system. We are typically involved in dozens of international projects, so it’s not unusual for us to look overseas like this. And when we started thinking about experts who might want to team up with us on this project, John Stempel’s name jumped right out.”

“Bert has been involved in ADR for over a decade and has shown over and over how well this process can work,” Stempel says. “He’s mediated over 300 cases and settled 80 percent of them, saving the interested parties, I’d guess, close to a billion dollars.” With the exception of their use in labor-related con-

flicts, Stempel adds, ADR methods—particularly mediation—have been used more than perhaps any other method in environmental disputes in this country.

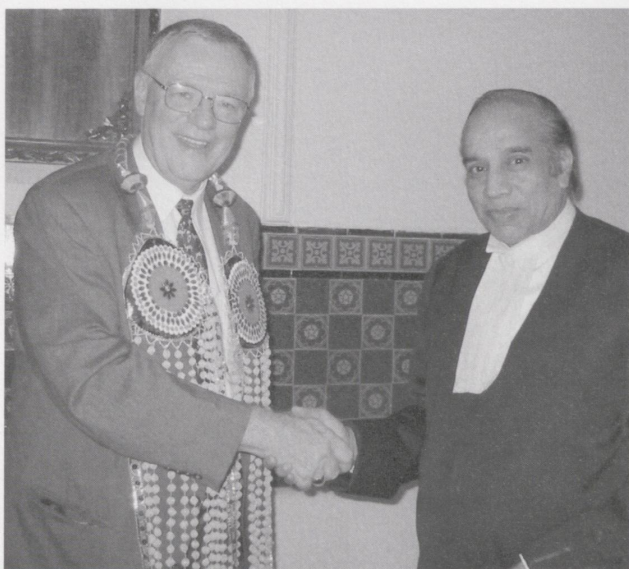
These cases are amenable to mediation due to several factors, Harberson explains. “The disputes involve multiple stakeholder groups, often a national interest group and one or more government parties. They are legally complex and expensive, requiring thousands of hours of preparation time by attorneys and others. They are almost always highly emotionally charged and require vast amounts of scientific and technical information.”

A local example involved the National Park Service (NPS), the state of Kentucky, a state and national environmental group, the city of Middlesborough, and Appolo Fuels Inc., a coal-mining company. The dispute was simple. The state issued a permit to Appolo to mine near the Cumberland Gap National Historical Park without first consulting with the National Park Service. In response, the NPS, city, and environmental groups protested the decision on the basis that the mining would interfere with visitors’ views and, therefore, prior consultation with the NPS was required.

“To their credit, the parties recognized not only the value of a mediated resolution, but worked hard to achieve one,” Harberson says. “In the end, an agreement was reached for scaled-back mining and the planting of additional trees to reduce the mining’s visual impact on the park. And the state and federal government agreed to enter into a memorandum of understanding to help avoid similar disputes in the future.”

“The more we talked about the situation in India, the more convinced we were that we could really help,” Stempel says. The two then turned to, as Stempel says, “a UK connection once removed”—former

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ON HIS TRIP TO INDIA TO DISCUSS ALTERNATIVE DISPUTE RESOLUTION, JOHN STEMPEL, DIRECTOR OF THE UK PATTERSON SCHOOL, RECEIVED A TRADITIONAL VIP GARLAND FROM M.J. SINGH, CHIEF JUSTICE OF TAMILNADU.

William L. Matthews Professor of Law at UK Tom Stipanowich. "Tom is one of the leading ADR scholars and practitioners in the world. He worked with us on our initial proposal, helping us think through some of the trickier problems." Stipanowich taught at UK from 1984 to 2000. He is now president of the CPR Institute for Dispute Resolution in New York City, the world's largest association of corporations and law firms that support dispute resolution techniques.

Stempel and Harberson then outlined a program and submitted a proposal to the United States-Asia Environmental Partnership, which gave them a thumbs-up—funding the project for two years. This pilot project, called the Conflict Resolution Partnership, funds travel to India to educate and equip the project's Indian partners to work on similar conflicts and develop a model approach for such disputes that could be used throughout India and the rest of Asia.

So in February of 2000, Stempel and Harberson found themselves on a plane to India.

Making Their Case

Twenty-four hours later, Stempel and Harberson touched down in Chennai, the capital of Tamilnadu State on the Bay of Bengal. Chennai, formerly called Madras, is Stempel's sold stamp-

ing grounds, and he admits it felt good to be back. "In some ways, it was as if I'd never left. Of course some of the young businessmen were now older businessmen and some of the government folks I'd worked with had retired. But it definitely felt comfortable being there again."

Before Stempel or Harberson could even shake off their jet lag, they were handed an itinerary of meetings and workshops for the next week—meetings with government officials, corporate executives, environmental protection organizations, and various representatives from the legal system.

"I'd call these 'high-energy' get-togethers," says Stempel. "Because my successor twice removed and I knew some people in the legal system, we got a good hearing throughout the area. There was tremendous interest in what we had to say about alternative dispute resolution, and a terrific opportunity for us to learn about some of the pending conflicts in their legal system."

Their discussions were tightly focused on the role of ADR in legal disputes and explored the possibilities that ADR could play a part in the country's judicial process. "The chief clerk of the Supreme Court was at one of these meetings, and he arranged for a meeting with the Supreme Court Chief Justice and his colleague on the environmental bench, Justice Sampath," Stempel says. "When we met with them, they quite readily

saw that this was very likely a good way to clear away some of the legal logjam they were dealing with. This was a breakthrough meeting."

Another result of their interactions in India was that the complicated and emotionally charged focus on lawsuits involving the environment has been broadened to what is termed "technology-heavy" environmental disputes.

"Technology heavy," Stempel explains, "refers to the fact that sometimes environmental disputes can be resolved by a higher level of technology." He cites the example of a company in Bangalor that produces leather goods. The chemicals used in the production process pollute the nearby river. The company has been able to clean up the water to the point where it's safe to drink, but there's still a problem.

"Problem is," Stempel says, "the water is blue—safe to drink but blue." (He raises his empty coffee cup in the air and says, "Anybody wanna drink some Tidy Bowl?") "So it's an aesthetic problem." It so happens, he adds, that when this problem was mentioned to him on his last trip, he knew of a solution, one close to home.

"There are similar plants in Kentucky that have technology sophisticated enough to not only clean up after themselves but to also make the water clear again. That's the kind of technology we can pretty readily export, though it'll take some time for the Bangalor factory to buy the equipment and get it set up," Stempel says. "This is an example of putting to use the knowledge that we took with us."

The ADR approach to conflict resolution is now a formal proposal awaiting Supreme Court approval. "We have every reason to believe this will be approved," Stempel says. "As most things in legal systems worldwide, it will just take some time." ■

Patterson School Helping Kentucky Prepare for the Worst

How prepared is Kentucky for a terrorist attack? This is a question that faculty at the UK Patterson School of Diplomacy and International Commerce have been working to answer, and their fieldwork started long before September 11.

"In 1998 Mike Desch headed up a group that focused on weapons of mass destruction, domestic preparedness and the Kentucky National Guard," says John Stempel, director of the Patterson School. "So this has been a major area of focus for us for over three years." Desch, associate director of the Patterson School, is a national security scholar who came to UK from Harvard University in 1998.

"Four of us from Patterson and five others with expertise in nuclear, biological, and chemical warfare met with top officers of the state's National Guard to discuss potential threats to the commonwealth and suggest how the state can deal with those threats," says Desch. He explains that though most conventional military weapons, from 2,000-pound bombs to assault rifles, can cause large numbers of casualties and widespread destruction, the term "weapons of mass destruction" specifically refers to three classes of weapons: chemical, biological, and nuclear weapons.

The Patterson School's 50-page report that followed included several recommendations: more communication and integration among the several state agencies (the National Guard and the Kentucky Department of Emergency Management, for example), especially during the initial stages of an emergency; a plan for coping with hoaxes; and upgrading the Guard's chemical weapons capabilities.

After this report was released in April of 1999, two members of the Patterson School security research group took an even broader approach to the problem. Robert Pringle and Clifford Tsuboi, along with half a dozen Patterson School students, began an ambitious project to meet with government officials in all 120 Kentucky counties to discuss potential terrorist threats.

"Cliff and I took a contract financed by the U.S. Department of Justice to look at vulnerabilities and capabilities of Kentucky to deal with a weapons of mass destruction attack," says Pringle, a retired CIA officer who came to UK in 1999 [see also "Bringing New Intelligence to the University"—www.rgs.uky.edu/ca/odyssey/fall99].

"I focused mostly on the question of just

how concerned various parts of the state should be about a terrorist attack—by either a homegrown organization or a foreign-based group—and what forms an attack might take. I went to every county courthouse in the state, meeting with state police, the FBI, and firefighters. We talked about the most probable scenarios, who is most likely to cause those problems, and the best ways to respond. The idea was to look closely at vulnerabilities."

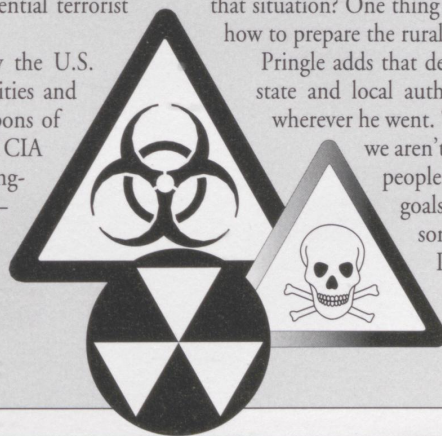
In this outreach project Tsuboi played a complementary role, focusing on the state's public health emergency preparedness. "I contacted public health officials in counties and districts all over Kentucky to assess the capabilities of local public health centers to respond to biological, chemical, and radiological emergencies," says Tsuboi, a retired lieutenant colonel in the U.S. Army Reserve who has a doctorate in biopharmaceutics from UK and who specializes in biogenetic warfare and bioterrorism.

This assessment comes in the form of a 57-page questionnaire from the Centers of Disease Control in Washington, D.C., which is sponsoring this nationwide study. "So far eight states have completed their assessment, Kentucky included. What we're going to do is eventually enter all this information into the Department of Justice database, then try to develop a clear overall picture of what we have to do to address problems throughout the U.S.," Tsuboi says.

Pringle adds that once the data are crunched and the responses evaluated by several levels of government, Kentucky is going to have to make a hard decision: Where do you put the most money in order to try to assure the safety of the most people?

"We're especially concerned about how to protect what we call the 'first responder' in a terrorist attack. If you're a state trooper and at 3 a.m. see a small convoy of white panel trucks full of men wearing army fatigues roll past on the highway, and you think of stopping them, what do you do to avoid being killed in that situation? One thing I've talked about around the state is how to prepare the rural police for just such a scenario."

Pringle adds that despite the "impossible workloads" of state and local authorities, he was generously received wherever he went. "We need to underscore the fact that we aren't out there in the state trying to make people feel uncomfortable. But one of our goals is to let people know that they have some expertise to tap into here at the Patterson School if they need to." ■



Noteworthy Prima Donna Enjoying New Role at UK

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

Unassuming. That's the only word that can describe my first impression of Gail Robinson. And it's not one you'd necessarily associate with someone who's lived the life of a prima donna. Or someone who has a framed cover of the Italian magazine *La Follia*, featuring Pavarotti and herself on stage, on the piano in her office.

But that unlikely word is the best way to describe this woman who came to the University of Kentucky as an endowed chair in voice after two decades as a world-renowned soprano and 12 years as an administrator committed to educating and elevating young singers at America's most prestigious name in opera, the Metropolitan Opera in New York City.

She mentions, almost in passing, that she sang at the White House for the Nixons and President Tito and at the palace in Monte Carlo; she seems a little awestruck herself at the "wonderful things" she has experienced because of opera.



GAIL ROBINSON AND SOPRANO
PATRICIA ANDRESS, WHO IS PURSU-
ING HER DOCTORATE AT UK, WORK
ON SOME VOCAL EXERCISES.

The Jackson, Tennessee, native has an intermittent stutter, most often on words beginning with "m," "n," and "s," but it's something that never hindered her singing. "I've had it all my life. I'm so grateful to have been able to express myself in song, because I get so hung-up in speech sometimes," she says, the frustration evident in her voice.

And then there's the rheumatoid arthritis. Looking down at the tell-tale swollen knuckles, she explains why she had to stop performing. "I've had arthritis since I was 19—had it my entire singing career—but it just got to the point that trying to do staged opera was so physically demanding that it took the joy out of singing.

"I said to my husband the other day, if God would come to me and say, 'I gave you too much, so I'll take back either the stammer or the arthritis.' I'd say to him, 'Take the stammer.' I can deal with the pain. I just would love to be able to express myself eloquently all the time."

Robinson found her voice early; she sang in the church choir, for civic events and talent shows, but had no background in opera at all. She thought she'd study piano, but ended up enrolling as a voice major at Memphis State University and was cast in her first opera, "Cosi Fan Tutte," at age 19.

"And my teacher entered me in the Met auditions [which require singers to be between 19 and 33] in Memphis for the experience of singing on a stage in front of an audience and receiving critical feedback from a judge. And I won—that was very unexpected—and it brought me the opportunity to go to the big city. It was my first plane trip."

Dressed in a turquoise chiffon gown and shoes dyed to match, Robinson sang on the stage of the Met in the spring of 1966. "I was so naïve. I didn't know how important



ROBINSON AND RICHARD STILLWELL PERFORM IN A 1978 CANADIAN TELEVISION MOVIE OF ROSSINI'S "THE BARBER OF SEVILLE."

it was or that I was supposed to be terrified. I just had a wonderful time. It was a fairytale experience." She won in the finals and was invited to be part of the Met Studio, known now as the Lindemann Young Artist Development Program, which is still the preeminent training program in the country. "I was in the program for three years, and then I was asked to join the parent company and stayed for 20 years as a singer."

Robinson's first real splash came in Detroit, and it was "a star is born" kind of thing—in fact, that was the headline over her photo on the front page of the *Detroit Free Press*. "The Met was on tour, and I was the understudy for Roberta Peters, who was scheduled to sing the title role in 'Lucia di Lammermoor.'" This opera, based on the novel by Sir Walter Scott and sung in Italian, is perhaps the one most associated with Robinson. "It's got a mad scene that goes on for 20 minutes and ends on a high E-flat," she says. "I was so prepared. We started out in Boston and went

to D.C., Atlanta, Cleveland, and we got to the final stop of the tour in Detroit and I thought, 'Well, it's just not going to happen.' And then Roberta got sick. I stepped in on a day's notice, and it was really a Cinderella story. Placido Domingo was the tenor that night."

Domingo, who has earned fame as a singer, conductor, and artistic director to the Washington and Los Angeles operas, had a hand in introducing Robinson to her future husband Henno Lohmeyer. "He was a television producer in Germany," she says. "He was doing an hour-and-a-half opera special and hired me on Placido Domingo's recommendation." Lohmeyer and Robinson eventually married and lived in Germany for five years.

"After our second child was born, he decided he wanted the children

to be educated in America, and we came back here," she says. The family settled in Greenwich, Connecticut, and Robinson cut back on her traveling, working mostly at the Met, with the exception of the occasional recital or symphony. "I really wanted to be there for my children. My husband is an extraordinary father, and we always had a nanny so I knew the children were having a great time when I was gone," she says. "I was the one sitting in my hotel room, crying into my room-order soup."

Of all the roles she played over the years, Robinson most cherishes the one she portrayed in the opera of the children's classic "Hansel and Gretel." "Singing Gretel was just one of the most fabulous experiences because I had two small children and it brought them so much joy," she says. "Ocean Spray cranberry juice had a float in the Macy's Thanksgiving Day parade, 'The Metropolitan Opera's Hansel and Gretel,' so I got to be Gretel on a freezing cold morning; but it was one of those once-in-a-

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Luciano Pavarotti as Nemorino and Gail Robinson as Adina in a scene from Donizetti's "L'Elisir d'Amore"

FAMOUS TENOR
LUCIANO
PAVAROTTI AND
ROBINSON GRACE
THE COVER OF THE
ITALIAN MAGAZINE
LA FOLLIA IN
1980.

lifetime experiences."

Another memory of performing as Gretel brings more pain than pleasure. "There was a tremendous amount of dancing, jumping and climbing up in a hayloft onstage. It was the most physically demanding part I ever sang. I broke my foot during a performance; about 10 minutes from the end of the opera, I heard it snap. There were 4,000 people there, and you haven't even pushed the witch in the oven, so you don't have a choice, you've got to keep going," she says.

"It was funny because my doctor happened to be in the audience that night; he brought his three children. They came backstage afterward and I was propped up

against the door signing autographs for a long line of people. I called him over and said, 'I think I've broken my foot.' His expression clearly read, 'These melodramatic sopranos.' We went to the hospital, but I felt that I was just being humored. He came in the door with the X-rays (I'll never forget his face) and he said, 'You've broken your foot!'"

When Robinson decided to retire from singing, the Met asked her to be a part of the administration. She became executive director of the Metropolitan Opera National Council Auditions ("the same program that started me into singing") and the director of the Young Artist Program. "So I found myself sitting in the chair giving advice to young singers," Robinson says. "The chair I had come to so often to seek advice. It gave me a unique perspective on those jobs, because I had been through both of those programs. It was not possible for a singer to sit across from me and say, 'But you don't understand....' Because I did.

"If you go through the names of the top American singers, almost all of them have been identified through the National Council Auditions," she says. These auditions, first held in 1952 to identify and nurture young talent, bring the 17 district finalists (selected from a pool of 2,000 singers from all over the country) to the Met, where they spend 10 days being coached, going to operas, going backstage to talk to singers and conductors, and then ultimately singing on the Met stage accompanied by the Met orchestra. Robinson says this is an amazing experience for anybody, particularly singers in their 20s or 30s.

"The American singer is the best-trained singer in the world," Robinson says. With more than 100 professional opera companies in the United States, most of them with apprentice programs, today's U.S. singers can stay in the country to be trained. And the great thing about advancing to the finals, Robinson says, is not only the experience of singing and studying at the Met, but also the fact that agents, company managers and conductors—people who are in a position to jump-start a career—are in the audience. "It's phenomenal exposure."

One singer from UK will get that exposure in April. Corey Crider, a 25-year-old baritone and Marion, Kentucky, native, won the Tri-State Regional Audition held in UK's Memorial Hall in November. Crider competed against nine of the best singers from Indiana, Ohio and Kentucky. He sang three arias for the judges. The first was a selection that showcased his acting as he cataloged the conquests of Don Giovanni (Mozart's character based on the lascivious Don Juan). And it didn't matter he was singing in Italian; it was clear what he was talking about. "Corey is a very gifted singer and actor. He has a lot of things going for him. I imagine the people in New York are going to sit up and take notice," Robinson says. Crider has spent two years under the direction of voice teacher Stephen King, who has been at UK since 1994.

"It's nice that UK is in a position now not to be considered an 'also ran,'" Robinson says. "Because it was always Indiana University, Cincinnati Conservatory of Music and, oh, Kentucky. But now we're right up

there with the other conservatories in terms of the talent we turn out, and we're all very proud of that."

In fact on Monday morning after the regional audition, Robert Shay, dean of the College of Fine Arts, sent an e-mail to UK President Lee Todd, who was out of town that weekend. It read: "The UK opera team won its bowl game on Saturday."

As Shay says, "We beat a couple of nationally ranked teams, and, in part, I think this is because of Gail's presence. The fact that she is here has made an enormous difference in terms of our ability to recruit the best students, because they know what it means to study with somebody like Gail Robinson."

"**S**he has brought a level of sophistication people expect to find at major conservatories around the country," says Everett McCorvey, who has lead the opera theatre program since 1996. The opera program is part of UK's 85-student voice program. McCorvey, who has known Robinson since his days as a free-lance singer in New York, has judged competitions with her and interacted with her while he was in charge of reviewing young-artist programs for the National Endowment for the Arts. "Gail has considerable knowledge in the business of opera. In her position at the Met, she was the most powerful person in terms of influencing careers of young artists in this country," he says.

And this was evident even to the students as she taught a class during her first visit to the university. "I invited her to come down to see two productions, with two casts, of 'Cosi Fan Tutte,' and she taught a Master Class. About midway through the class, you could just tell that the students had the realization that this lady could change their lives. And it was a big moment for the students. She has that sort of clout in the business," says McCorvey.

"She's a household name in New York City opera circles," Shay says. "And they all said, 'She's going where?!' They could sort of understand why she left the Met to go into academia before she retired, but she didn't go to Indiana. She didn't go to Michigan. She went to the University of Kentucky, and I believe that made big

ripples in New York City."

"I was impressed by the talent of students and the dedication of the faculty," Robinson says. "The endowed chair had a lot to do with having the courage to quit a job that was secure and come to this unknown territory, because I thought if the vision of the administration is such that they will endow a chair in voice, that speaks well for the university. And I wanted to go to a place where I could make an impact."

"She pours herself into her teaching," Shay says. "That's one of the things that separates our program from others. Like all the big programs, we now have a star. But unlike most others, our star has become invested in the students, the program and in the community. Other stars fly in, do their teaching, and leave. Gail Robinson has become a real part of our students' lives." ☐



ROBINSON'S PUBLICITY PHOTO FOR THE METROPOLITAN OPERA'S 1985 PRODUCTION OF "HANSEL AND GRETEL"

"She's a household name in New York City opera circles. And they all said, 'She's going where?!'"

—Robert Shay, dean of the College of Fine Arts

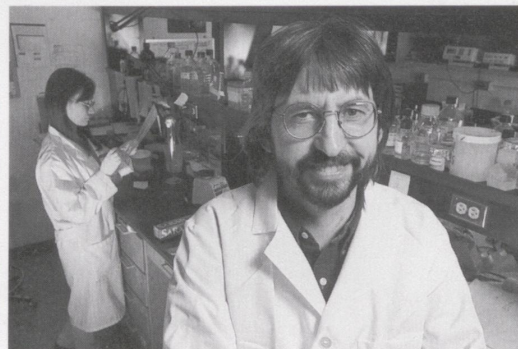
New Recruits Advance Plant Science

THE RESEARCH CHALLENGE TRUST FUND (RCTF), COMMONLY CALLED "BUCKS FOR BRAINS," PROVIDES SUPPORT FOR ONGOING EFFORTS TO ATTRACT AND RETAIN RENOWNED FACULTY.

"IN THE UK COLLEGE OF AGRICULTURE, RCTF FUNDS HAVE BEEN USED TO HIRE FOUR YOUNG RESEARCHERS, SHINING STARS IN THE FIELD OF PLANT SCIENCES," SAYS SCOTT SMITH, DEAN OF THE UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE. "THEIR RESEARCH FINDINGS WILL NOT ONLY ADVANCE THE KNOWLEDGE OF SCIENCE, BUT WILL ALSO BENEFIT KENTUCKY FARMERS ALMOST IMMEDIATELY."

PETER NAGY IS WORKING TO TURN VIRUSES AGAINST THEMSELVES WITH THE GOAL OF PROTECTING PLANTS FROM HARM.

PHOTO BY MATT BARTON



Helping Plant Viruses Self-Destruct

Peter Nagy loves to help plants make mistakes.

"The idea goes something like this," he explains. "Viruses invade their host, set up housekeeping, then start copying themselves, like a super-powered Xerox machine, at a frenetic pace. But because the virus copies itself so fast, it makes mistakes." These mistakes, he adds, aren't all small and inconsequential. "Luckily for us, the virus makes some pretty serious mistakes that can lead to its own eradication."

Those self-destructing mistakes—and how they can be used to protect plants from viral harm—are the subject of Nagy's research. A plant virologist, Nagy arrived at the UK College of Agriculture two years ago from the University of Massachusetts, where he completed postdoctoral training.

Viruses, which are much too small to be seen without the use of a special microscope, come in a variety of sizes, shapes, and structures. (Several hundred thousand of them could fit into the period at the end of this sentence.) Some of these tiny entities copy themselves using DNA, as animals do, and some replicate using only RNA, because that's all they contain.

RNA-type viruses are the most abundant types; those that cause the human cold, encephalitis, and flu are all examples of this type. These viruses make many more mistakes in replicating than do the DNA types. During the copying process, bits and pieces of the genetic code are written erroneously, with letters left out, so to speak. These mistakes sometimes become full-fledged "superparasites" that attack the virus (the "mother parasite") from which they came.

Nagy's research is focused on how to help the RNA-viruses make mistakes more quickly and more often so that molecular superparasites developed from the virus can out-compete—and either minimize or eliminate—the parent virus before it has debilitated or killed the plant.

In his laboratory, Nagy has been able to cause mistakes in a destructive virus that is widely found in wild tobacco, cucumber, and tomato. He does this by simply rubbing a bit of the genetically modified "mistake" virus on a leaf of wild tobacco, previously infected with the "parent" virus; then he waits for two days.

"The new superparasite out-competes its parent virus and the plant recovers in a few days and can then thrive," Nagy says.

He is optimistic that his technique can be refined and used to help farmers protect their crops. "Conceivably, the skilled plant breeder will be able to breed into seed the mistake virus so that the plant will be protected from the time it germinates."

Creating Wetlands for Cleaner Water



ELISA D'ANGELO IS FOCUSING HER WORK ON HOW TO MAKE CONSTRUCTED WETLANDS MORE EFFICIENT. IN KENTUCKY, 80 PERCENT OF NATURAL WETLANDS HAVE BEEN LOST TO ENCROACHMENTS OF FARMING AND COAL MINING.

centuries old?

These questions are at the core of plant scientist Elisa D'Angelo's research. Her work focuses on the nutrient storage and transforming capabilities of man-made wetlands (called mitigated wetlands by scientists). Specifically, she's monitoring, at the site and in the laboratory, several key biochemical processes that occur in wetland soils and that are responsible for water-quality improvement at more than a dozen man-made and natural wetlands in western Kentucky.

Wetland soils, compared with upland and aquatic soils, says D'Angelo, who came from the University of Florida in May 1999, are unique in that they harbor microorganisms that biochemically purify water that flows through them. "The science of creating man-made wetlands, on the other hand, is still in its infancy. And without accurate knowledge, we can only guess at where and how man-made ones need to be built."

That guesswork can lead to costly or inefficient use of constructed wetlands.

"If the constructed wetland works only half as well as a natural one, we would need to use twice as much land to achieve the same results, since the federal government may require as much as 10 acres to replace the five that have been developed," she explains. "Obviously, this 'two-for-one' rule can be very expensive."

To try to determine the efficiency of wetlands, D'Angelo takes a unique, biogeochemical approach: she measures physical, chemical and biological processes inside the wetland rather than simply measuring only what goes into the wetland area and what comes out. This influx-outflux approach has been the standard technique for many years.

"We know the big-picture processes responsible for water purification in wetlands such as deposition of nutrient-enriched sediments and plant detritus, the decomposition of organic matter by bacteria, how nitrates are processed and the like. How efficient these processes are depends on environmental conditions and microbial communities in the wetlands, which are likely different in man-made sites compared with pristine ones," she says.

How nitrogen and phosphorus work in the wetlands is the focus of her research; both elements, she says, are responsible for the algal blooms and aquatic plant-clogged waterways. Besides causing off-flavors in drinking water and being a nuisance to boaters and fishermen, decomposition of dead algal cells and plants in lakes and streams leads to lower levels of dissolved oxygen, a condition that kills fish.

"In looking at the two kinds of wetlands, we expect that there will be significant differences in rates at which water impurities are processed and also differences in microbial communities that process them," D'Angelo says. "We hope our results will provide scientists and engineers the necessary tools to assess whether an engineered ecosystem is following the correct track, so that actions can be taken to correct a failing system."

Ecologists sometimes call marshes, bogs and swamps the "kidneys of the landscape," because through a slew of physical and chemical processes they remove pesticides, nutrients and metals contained in water. Mother Nature's water-treatment plants, these wetlands cleanse water entering lakes and streams, and support a wide range of wildlife, from frogs to birds and other animals.

In Kentucky, 80 percent of natural wetlands have been lost, due mostly to the encroachments of farming and coal mining. But Kentucky is actually increasing its wetland acreage, thanks in large part to federal rules that require developers who disturb natural wetlands to replace them with man-made wetlands on an acre-for-acre basis, and in some cases even more.

But are these constructed wetlands the real deal? How well do they purify water compared with natural wetlands that are

Gaining Insight into Seeds

How smart are plant cells? Sharyn Perry, in the Department of Agronomy, is trying to find out. Her goal is to understand how plant cells “know” how to develop as seed tissue that eventually grows into a new plant.

“It’s really molecular biology with an agronomic purpose,” says Perry, who earned a doctorate in molecular biology from the University of Wisconsin. Her research focuses on something called AGL-15, which is short for AGAMOUS-like 15, a protein involved in gene expression. AGL-15 sets in motion what scientists call transcription machinery—enzymes that glide down the DNA and turn genes on or off. If the gene is turned on, the plant develops a certain way; if it is turned off, the plant develops quite differently. AGL-15 is a necessary “light switch” which directs genes that eventually command cells to develop into seed.

To gain insight into this process, Perry first mechanically pulverizes plant embryos of *Arabidopsis*, a weed of the mustard family. The resulting dust is treated with an antibody developed from rabbits that binds to AGL-15, which is, in turn, bound to the DNA.

Tiny beads of agarose (a compound used in a variety of applications, including making ice cream) are added to the mixture and bind to the antibody. Then, after the mixture is whirled a bit in the centrifuge, a device that revolves so fast that heavier parts of a solution are pushed outward, the agarose beads, now with the antibody, DNA, and protein clinging to them, are heated.

The heating process separates the DNA pieces from the protein. The “cleaned” DNA pieces are then compared with the known *Arabidopsis* genome map to see exactly where the AGL-15 is positioned.

PHOTO BY MATT BARTON



“By comparing the DNA fragments with the known genome map, we can find out exactly which genes are turned on or turned off by AGL-15,” Perry says.

So far, her research has isolated and identified genes that are regulated by AGL-15, but many more tests are needed to fully understand how the regulated genes function in seed development.

“Finding out what genes AGL-15 controls will help us understand how this particular protein functions during plant development,” Perry says. “Because this protein is a member of a protein family believed to be involved in critical developmental decisions of fungi and animals, as well as plants, I am hopeful this research can help our understanding of the cell differentiation process in many organisms.”

So how does all this work relate to the average citizen, the non-scientist?

SHARYN PERRY'S RESEARCH IS FOCUSED ON THE PROCESS OF HOW PLANT CELLS DEVELOP FROM SEEDS.

“If you think about it, seeds are really very important to human beings,” Perry says. “Most of what we eat is from seeds—wheat, corn, and rice. Beans are important, too. It’s been estimated that 70 percent of the human diet comes directly from seeds, and the rest is all from animals that feed on grains—seeds—and crops propagated by seed.”

Hi-Tech Farming

The focus of soil scientist Tom Mueller's current research can be summed up, he says, in three words: precision agriculture technology.

He is using and assessing various technologies that can benefit Kentucky farmers, including yield-monitoring sensors that record how much grain is harvested in each small section of a field, and global positioning systems (commonly known as GPS), which can locate precisely where a tractor is in a field by using triangulating signals from space. GPS is analogous to time-tested systems mariners use to keep tabs on the whereabouts of their ship in the ocean.

Yield monitors, soil sensors, GPS, and remote sensing devices can work in tandem to gather and record information that farmers can use to make better crop decisions, says Mueller, who received his doctorate from Michigan State University.

"Many farmers in Kentucky are already using yield-monitoring devices to map grain yield each second as they traverse their fields," Mueller says. "This allows them to identify low or marginally productive areas that may respond to site-specific management."

And while farmers have been using the technologies of precision agriculture for a few years now, Mueller's research could make high-tech farming even more precise. His work is multifaceted, and he is quick to point out that he routinely teams up with colleagues in agronomy, agricultural economics, agricultural engineering, and other plant sciences.

One of the areas where he has made a major contribution is in soil conductivity research. Mueller and one of his graduate

students, Than Hartsock, have shown that the electrical conductivity of soils is related to topsoil depth and depth of fragipan, a hard layer often found in soils that thwarts root growth and limits crop-available water. Measuring how well soil conducts electricity in a field gives some indication of yield potential.

In recent work, Mueller and Hartsock measured soil conductivity in a field at different times during a year-and-a-half period using special devices called coulter. Coulter, which look like buzzsaws without teeth, spin and slice through the soil as they are pulled through a field behind a slow-moving tractor. Soil conductivity is determined by comparing the intensities of electrical charge from one coulter to another.

"What we found is that conductivity varies over time and is dependent on environmental conditions such as soil moisture," Mueller says.

"But even though absolute soil conductivity values are moisture dependent, the relative patterns in the field are pretty stable during a large range of moisture conditions."

"Precision technologies are here to stay. I hope my work will help Kentucky farmers make better use of their resources and improve the profitability of agriculture in Kentucky," Mueller says. ■



TOM MUELLER HAS MADE A MAJOR CONTRIBUTION IN SOIL CONDUCTIVITY RESEARCH. MEASURING HOW WELL SOIL CONDUCTS ELECTRICITY GIVES AN INDICATION OF YIELD POTENTIAL.

Chi-Sing Man Heavy into Light Metals

The University Research Professorships were established in 1976 to recognize outstanding research achievement. The professorships carry an award of \$35,000 to enable professors to devote full time to their research or continue to teach and use the award to support research activities. Since the inception of the award, there have been 89 University Research Professors at UK. Funds for this award are provided by the Office of the Vice President for Research.

Let's start with a platitude: A chain is only as strong as its weakest link.

In the Department of Mathematics at the University of Kentucky, Chi-Sing Man's work on the microstructures of aluminum and titanium may call this aphorism to mind.

"To the naked eye, the polished surface of a metal sheet appears as a clear, unbroken continuum," says Man, who came to UK from Johns Hopkins University in 1985. "But looking into his microscope, a metallographer can see the underlying polycrystalline structure. The orientation of the crystals, or grains—their texture and how they arrange themselves together—exerts a strong influence on the mechanical behavior of the larger structure."

Apart from the pure science interest in understanding these sub-structures, such work might lead to actually saving people's lives. For instance, the National Transportation Safety Board determined that an undetected metallurgic defect in a titanium fan disc of the No. 2 engine caused the crash of a United Airlines DC-10 in Sioux City, Iowa, in 1989.

Man explains that the tiny grains which make up a piece of metal are simply imitating nature. Ice and rocks are made up of tiny crystals that assume different orientations in space. Their shape and size and the way they fit together determine the discernable object's shape and strength. Think of a snowball. Its "throwability" is dependent on how our hands shape and pressure—or re-orient—the billions of ice crystals that comprise the frozen globe.

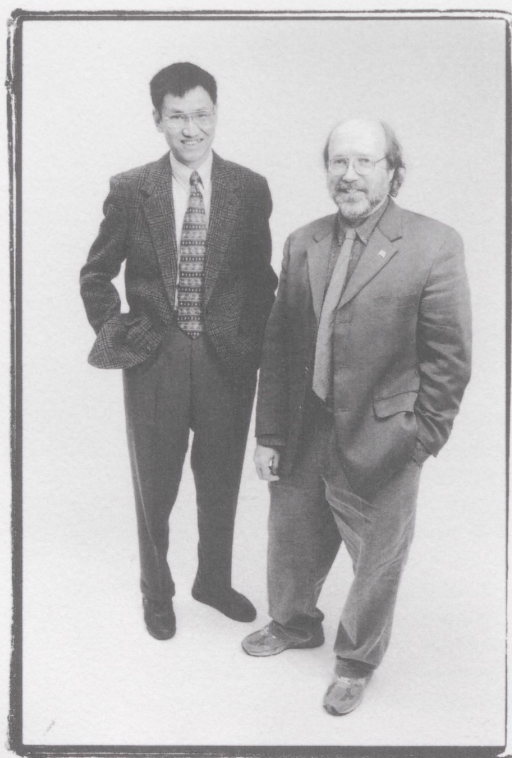
It's clear that microscopic properties of materials are crucial to their flexibility and durability, but what does this have to do with math?

Man explains: "Sound mathematical models that predict the response of these materials to stress, and enable accurate measurement of material properties, are of clear interest and importance to industries like Commonwealth Aluminum and GE Aircraft Engines that have partnered with federal agencies such as the Department of Energy and the National Science Foundation to co-sponsor my research."

A fundamental problem, he says, is to determine what's going on at the microscopic level of a metal and how that composition affects the behavior of the material in a mathematically tractable way. "It is clearly impractical to measure the orientation and

other microscopic properties of each individual crystal in a polycrystalline material. Instead, a statistical approach must be used in which these microscopic properties can be described by a probability distribution. A sound mathematical model enables us to both measure the material properties and to predict the mechanical behavior of materials once the microstructural properties are known," Man says.

"Chi-Sing's work is bringing to the University of Kentucky exactly the kind of national recognition for outstanding research we aspire to," says Peter Anton Perry, chair of the math department. "His ambitious research program is bringing to fruition five years of research in continuum mechanics that he has developed in collaboration with students and colleagues both in mathematics and in chemical and materials engineering."



CHI-SING MAN AND THOMAS WIDIGER, TWO OF THIS YEAR'S UNIVERSITY RESEARCH PROFESSORS



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Thomas Widiger Re-thinking Personality Disorders

Either you have it or you don't."

Thomas Widiger, a professor in the Department of Psychology at UK, says this is how personality disorders have been traditionally defined, and he's quick to take issue with this "either/or" way of thinking about such maladies.

"The American Psychiatric Association believes that someone with a personality disorder is qualitatively distinct from someone with a normal personality," says Widiger, who began his career here in 1982. He adds that such a characterization is based on the analogy of a medical disorder—you either have cancer, for example, or you don't. "My major work is arguing that these personality disorders actually represent a maladaptive variant of common personality traits."

The analogy Widiger prefers has to do with intelligence.

"We think of intelligence, as measured by IQ, as a continuum. All of us can be located somewhere along this continuum." Mental retardation, he says, is simply an arbitrary point on this line. "And it follows that people defined as mentally retarded aren't different in kind, only in degree."

Widiger believes that the same is true of those with personality disorders, even the most extreme disorders.

"It's fairly common for people to think of someone like, for instance, Ted Bundy as a totally alien creature," he says. "The press called him 'a monster,' and though it might make us feel better to think this is somehow true, the fact is that he wasn't different—in kind—from us at all. Many of the genes that provided his pathologic dispositions are present in the general population." Bundy, who was convicted of three murders and died in the electric chair in 1989, was suspected of at least 25 abductions and murders of young women. "It's not that everybody has the potential to be a Ted Bundy, not at all," Widiger quickly points out. "But what made Ted Bundy what he was is the same thing that made your personality." A growing number of psychologists and psychiatrists are coming to believe in this idea of seeing this as a continuum, he says.

In his work on personality disorders, Widiger uses a theoretical model called the Five-Factor Model (FFM), which describes five broad domains of personality: (1) neuroticism versus emotional stability, (2) extraversion versus introversion, (3) openness to experience versus "closedness" to experience, (4) antagonism versus agreeableness, and (5) conscientiousness versus

negligence.

But where did these classifications come from? How can something as complex as personality be so easily categorized?

Widiger explains that in order to develop this taxonomy, he became a sort of geologist.

"Throughout the history of psychology, grand theorists have proposed which personality traits are the most important for describing yourself and other people," says Widiger. "My model involved just going to the dictionary, which can be seen as a sedimentary deposit of the most important observations people have made over thousands of years, and doing a lexical analysis of the language." The relative importance of a trait, he says, is indicated by the number of terms that have been invented to describe the various degrees and nuances of that trait. "The FFM domains and facets were identified precisely on the basis of their importance in describing oneself and others."

Widiger's interest in the diagnosis and classification of mental disorders has attracted the attention of psychologists and clinicians across the country. Recently, he has been asked by the director of the National Institute for Mental Health to be part of a task force for the next version of the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*.

"This comprehensive book, the source for knowledge about mental disorders since 1952, is massively important and necessary," Widiger says. "We have to have common language so we can talk with each other about what constitutes a mental disorder and what doesn't. Every hospital uses it and every government agency uses it."

One facet of Widiger's current research has to do with its application. He is working toward actual, clinical use of his model. With a small cadre of graduate students, Widiger is partnering with about 10 local clinical psychologists who have agreed to apply the Five-Factor Model to describe their patients. "Without the research professorship, which is supporting extensive data collection, funding for clinicians to provide their input, and funding of patients to participate in the study, I couldn't do this work," he says.

"We want to show that clinicians can actually use this model to define in a much more useful and helpful way various personality traits of their patients. I want to have an impact on the practice of clinicians and, in turn, have them impact my research." ■

Bobbie Ann Mason:

Zigzagging Her

BOBBIE ANN MASON: "I
WANT TO DO WHAT I CAN
TO PROMOTE THE LOVE OF
READING AND WRITING."



PHOTO BY JAMES BAKER HALL

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

Bobbie Ann Mason, who last July became the first writer-in-residence in the College of Arts and Sciences at UK, is proof that you can go home again—and thrive. “I am delighted to return to UK,” says Mason, who accepted a five-year, non-tenured position. “I have felt a special connection with the university ever since my undergraduate days here.”

She graduated from UK in 1962 with a B.A. in English, then went to New York, where she worked with several magazines. Mason received a master’s degree from the State University of New York at Birming-

ham from him, which sent me on the road to being a writer. He was a living, breathing writer right there in front of the class! That was terrific stimulation.”

Mason says that in her new position she hopes to provide exactly that kind of stimulation to students at UK. “I don’t have an agenda for my time here, but I hope I can help some students get as excited about language and writing and literature as I got when I was a student. I want to do what I can to promote the love of reading and writing.”

By the time she was in her late thirties,

hard of hearing and had never heard of the Pulitzer. So I repeated it, loud: PULITZER PRIZE! And she said, ‘Tulip Surprise?’ That was so great. I laughed for days.”

Mason spends a fair amount of time on the road, she says, doing readings and book signings. In talking with people, there is one question that pops up over and over: Why are there so many well-known, award-winning writers in Kentucky?

“I have long thought that back in the ’50s when the cluster of Kentucky writers began to emerge, there was a unique environment in Kentucky that produced the necessity

Way Back to UK

ham in 1966 and a doctorate in English from the University of Connecticut in 1972.

“I’ve lived near Lexington now for 11 years and have been on campus many times, but the day I officially became writer-in-residence I walked across campus, re-playing in my head my student days. It was as though I had come full circle, and the new position jarred loose the old memories. Walking from Holmes Hall to the journalism building, I felt, in a way, like the student again,” Mason says.

Mason credits her freshman English teacher at UK, Sheldon Grebstein, with getting her hooked on literature. “Until I took his class, I hadn’t been introduced to literature, other than the standard high-school fare, which had not caught hold in my imagination,” she recalls. “But Professor Grebstein had us read *For Whom the Bell Tolls*, *Of Mice and Men*, and *The Catcher in the Rye*. Imagine! I’d never heard of these books before.” Another professor at UK who impressed her was Robert Hazel, who taught creative writing. “I had two courses

Mason started to write short fiction. In 1980 *The New Yorker* published her first story. “It took me a long time to discover my material,” she says. “It wasn’t a matter of developing writing skills; it was a matter of knowing how to see things.” Mason’s primary subject through the years has been the working-class people of western Kentucky where she grew up, and she continues to explore this group in her most recent book, *Zigzagging Down a Wild Trail*. “All of these stories, to me, are about people busting out of something,” Mason says. “A lot of times they’re coming home, coming full circle in a kind of a zigzaggy way.”

Her first book of fiction, *Shiloh and Other Stories*, published in 1982, won the Ernest Hemingway Award. Her 1993 novel *Feather Crowns* won the Southern Book Award, and her 1999 memoir, *Clear Springs*, was a finalist for the Pulitzer Prize.

“When I told my mother on the telephone that this book had been nominated for the Pulitzer Prize,” Mason says, “she didn’t understand what I was saying. She was

and the opportunity for creative work,” she says. “Factors include repression in the South, the stultifying ’50s, poverty, poor education in the rural areas—all of these contributed to a wealth of serious material and a backlog of creative energy. When it got the opportunity, this pent-up energy was ready to explode; writers, when they discovered they could be writers, were ready to soar.” This cluster of writers included—and still includes—Wendell Berry, Ed McClanahan, Gurney Norman, and James Baker Hall. (Norman and Hall are associate professors of English at UK.) These writers are all former UK students and have been friends since the 1950s.

Hall, whose new book of photographs titled *A Spring-Fed Pond* includes several of Mason, is obviously pleased that his old friend has returned to UK. “Bobbie Ann is an international figure, and this association with her raises our prestige. It’s a thrill to have her here.”

The Well-Read Life

University Press Director Ken Cherry Retires

He's the first to admit he's a dabbler. But in Ken Cherry's case, it's been a good thing.

The Virginia native was schooled in many subjects—English, linguistics, history, sociology, geology, and French—at many places—the Art Center School of Design in Los Angeles, East Tennessee State University, and the universities of Colorado, Tennessee, Washington, and Virginia. He discovered an aptitude for writing in Army intelligence school, the training ground for his two-year term as a corporal during the Korean War. He worked summers in Tennessee at Kingsport Press Inc., the second-largest book manufacturing plant in the United States, where he learned to proofread, write trade articles, and run an innovative computer typesetting program.

Then he got a job at Duke University Press as a “raw, junior copyeditor” where he experienced a moment of epiphany. “I was sitting in my office, which was an old bedroom with a fireplace, and there were big, old pine trees outside. I was working away on a manuscript, and I remember thinking consciously, ‘This is like being paid money to play.’ I was hooked.”

Cherry went on to stints at presses in Georgia and Tennessee, and in August 2001 this poet, book reviewer, and editor retired as director of The University Press of Kentucky after 23 years. But the curiosity and vision that sustained his career are still very much a part of who he is.

“One of the great pleasures of being an editor is the breadth it gives you,” says Cherry, who oversaw publication of more than 500 titles during his term as director. “I know a million things. That knowl-

edge is this broad [throws his arms wide], though it may be this deep [shows a half-inch between his fingertips].” With a pause and then a chuckle, he says, “It comes in handy at cocktail parties.”

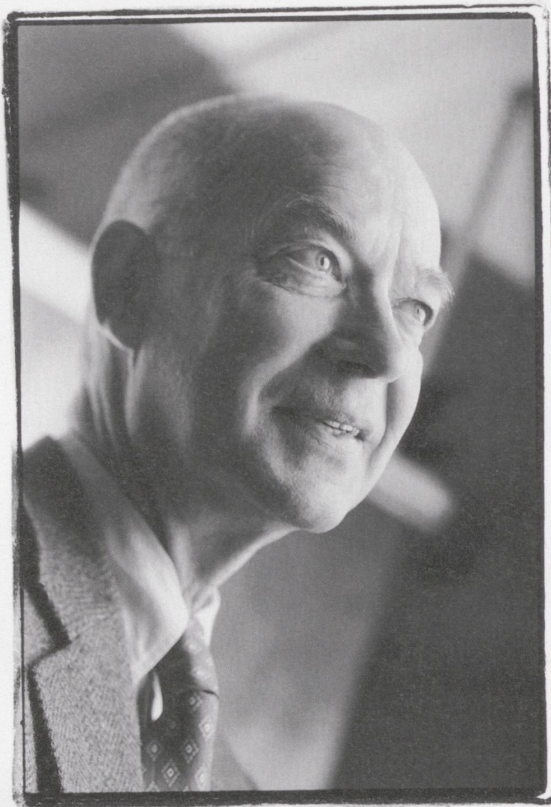
Kentucky's Press

The University Press of Kentucky, the successor to what was the University of Kentucky Press, was formed in 1969 as a publishing consortium that includes Kentucky's eight public universities, five of the state's private colleges, the Kentucky Historical Society, and the Filson Historical Society in Louisville.

“The press has a dual obligation,” Cherry says. “The basic charge—the reason for any university press to exist—is to publish scholarship by scholars for other scholars in order to advance human knowledge. The other part of that charge is a special emphasis on publishing books on topics related to the Commonwealth of Kentucky, the Upper South, Appalachia, and the Ohio Valley.”

He notes that the press brings out more books on Appalachia than any other publisher, and the press has been recognized for a number of books that shed light on Kentucky history and culture. The most notable include *The Kentucky Encyclopedia* (1992), “which we brought out on bicentennial day,” *A New History of Kentucky* (1997), *Atlas of Kentucky* (1998), *The Encyclopedia of Louisville* (2000), and *Our Kentucky: A Study of the Bluegrass State* (2000). “The *New History* is used as a textbook in a number of colleges in the state, and *Our Kentucky* is used at the fourth-grade and junior high level,” Cherry says.

Cherry's favorite book series, “New Books for New Readers,” is targeted



A NEW WAREHOUSE IN LEXINGTON, WITH AN INVENTORY OF ABOUT HALF A MILLION BOOKS, MEANS THE UNIVERSITY PRESS OF KENTUCKY CAN NOW TURN AROUND BOOK ORDERS IN TWO TO THREE DAYS. “IF AMAZON.COM CAN DO IT, WHY CAN’T WE?” SAYS CHERRY.

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

at a specific group of Kentuckians—adults learning to read. “When we looked at starting this in the 1980s, the only press we could identify that had books for new adult readers was Cambridge University Press. But those books were all very urban. They covered the ghetto experience and that was something people in New York City could identify with, but wouldn’t be relevant to a basically rural population.”

He points to the two most recent books in the series, funded by the Kentucky Humanities Council and the Scripps-Howard Foundation. One, called *Kentucky Home Place*, traces a farm family through eight generations, and the other, *Fights for Rights*, is a primer on the struggle for civil rights in America. Cherry calls this primer “the best capsule book on that subject I’ve ever read.”

“People can’t think unless they can read,” Cherry says. “A lot of people just sit back and let the emotions of television wash over them. If your only source of information is TV—a medium which boils down to hype and the buck—you can make some very glib, uninformed decisions.”

Making a Name

One important business decision Cherry made at the press was to focus on clusters—groups of books in particular subject areas. “The orphan won’t make it nine times out of 10,” he says. “You can’t publish just one book in Medieval French Literature and expect it to sell, because it just won’t work in the review system. You have

to have clusters of books to market them.”

Building clusters means finding niches, and one of the press’s most successful niches is 18th-century literature. “Can you believe The University Press of Kentucky is toe-to-toe with Cambridge when it comes to 18th-century lit?” The press has 45 books in this area, including reprints of rare period novels and scholarly studies of writers and their works.

Another niche, American military history, “just grew,” Cherry says. It started in 1978 with Philip Ardery’s *Bomber Pilot: A Memoir of World War II*, the first memoir by an American bomber pilot. “It goes on selling today, and that book has led to others.” The press currently has 47 books in print on WWII alone.

The press’s most recent niche, film studies, includes biographies of famous stars and studies of major studios like Paramount. This focus started in the 1980s, when film studies were not as respected as perhaps they are today, Cherry says. “We did a book on Sidney Lumet, a very impassioned director who is best known for his film ‘12 Angry Men.’” *Alfred Hitchcock: The Legacy of Victorianism* followed, as did biographies of Marie Dressler and Mary Pickford. “The editors in New York weren’t doing this kind of thing, but we found there’s a healthy market for it.”

An Unhectic Life

No deadlines. That’s the best thing about retirement, according to Cherry. “Publishing is a high-pressure, high-stress business,” he says, “and a very detailed business. Everything has to go right. If you’ve got errors in a book, they’re going to be there for 50 years.”

After years of pressure-reading—reading with the knowledge that you have to turn 200 pages tonight—Cherry is enjoying the opportunity to savor books. “I’m reading some things now that I have never read. I have started on George Eliot (whom my wife likes a great deal), the greatest woman novelist of the mid-19th century,” he says. “I like to read a group of works by an author. You learn a lot about the author’s vision of the world. It’s a wonderfully unhectic way to live.”

“Ken Cherry has built the press up to where it has a high standing among university presses. And he has opened the way for Kentuckians to get their history in ways that had never been there before.”

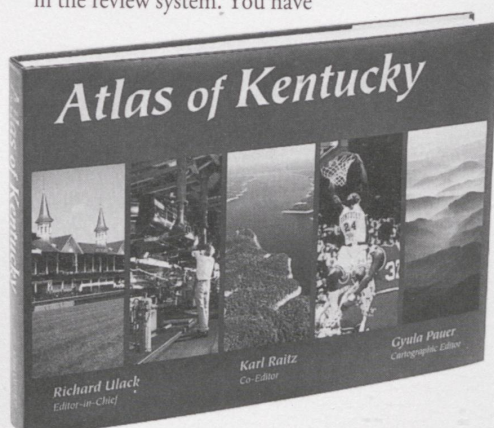
—Thomas D. Clark, Kentucky’s historian laureate and “father” of The University Press of Kentucky

“Ken is both a good publisher and a good man. He leaves his successor not only a fine list of books, but also a firm financial foundation.”

—Kenneth Scott, director of the University Press of Florida

“Year in and year out Ken Cherry devoted his full energy to the Press, and it yielded an enormous return. He brought great distinction to himself and to the University of Kentucky.”

—Jack Blanton, UK’s acting senior vice president of administration



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THE WEB AT
WWW.KENTUCKYPRESS.COM

Odyssey Turns 20

Sometime this spring—nobody can remember exactly when—*Odyssey* will turn 20 years old. I was around for the 10th anniversary issue, and I'm excited to be a part of this celebration, too.

Odyssey was imagined into existence in 1982 by Susan Stempel, who was in charge of producing UK's annual sponsored projects awards report. She wanted to produce a magazine oriented to the general public so that the university could showcase some of the good work being done here. Susan edited the magazine until her retirement in 1997.

Odyssey has always undertaken a particular obligation to publicize research whose aim is to improve our lives. If we have achieved this goal, it's only because hundreds of faculty and graduate students through the years have taken time to explain clearly and imaginatively what it is they do.

Personally, I feel indebted to everyone I've met in the past 15 years for the free education, for the provocative and informative conversations. I now know a little something about sensors and antennas, tree-roosting bats, global positioning systems, transgenic tobacco, human pheromones, the life cycle of stars, the history of university research, substance abuse among teenagers, the future of coal in Kentucky, membranes, aluminum research, and metal sculpture. I've seen our resident glassblower create vacuum manifolds and Schlenk flasks for the chemistry department, and I've seen how some innovative and impressive technology is helping Kentuckians with physical disabilities to more easily learn and communicate.

For a story we ran in the Summer/Fall 1993 issue, dressed head-to-toe in the requisite operating-room bunny suit, I watched UK plastic surgeon Henry Vasconez work to repair the skull of a baby whose enraged father had punched a hole in her head. Vasconez used wire mesh and fibrin glue to attach small pieces of the patient's bone



ODYSSEY 2002: SEATED (LEFT TO RIGHT) ALICIA P. GREGORY, ASSOCIATE EDITOR; JEFF WORLEY, EDITOR; AND DEB WEIS, DIRECTOR OF RESEARCH COMMUNICATIONS. STANDING ARE TERESA SHEAR, FREE-LANCE DESIGNER, AND LEE THOMAS, FREE-LANCE PHOTOGRAPHER.

over the dura matter. The baby lived and Vasconez, who has followed her progress these past nine years, tells me she has "flowered into a nice, happy child" with her adoptive parents.

In 1989, I had what is probably my most memorable assignment. I drove with our campus photographer to the Medco Center of Springfield, Kentucky, to interview Miss Lucy Powell, one of 500 Kentucky centenarians participating in a UK study on aging. Lucy, age 102, was clear-headed, engaging, and loved to talk. She'd lived her entire life in the Mackville, Kentucky, area and raised crops and livestock with her husband until his death in 1958. She was thrilled to be our cover girl of the Winter 1989 issue, but told our photographer before he went to work: "Now you do this right, sweetie. The last feller made me look like an

old fish." Lucy died in 1994, at the fine, old age of 106.

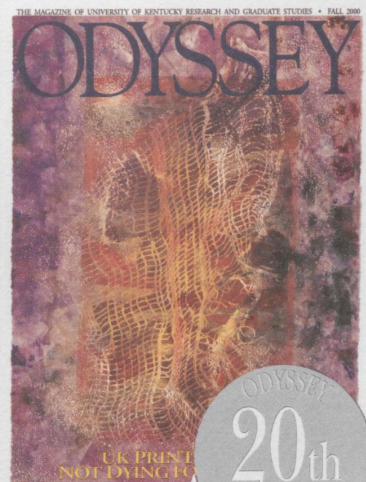
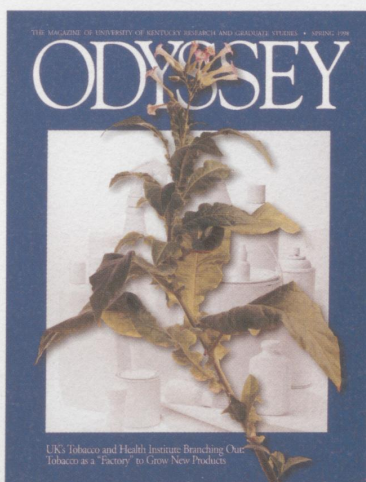
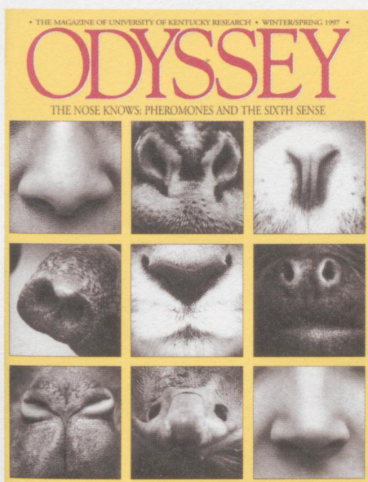
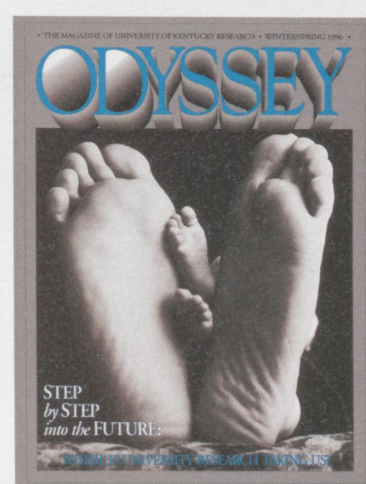
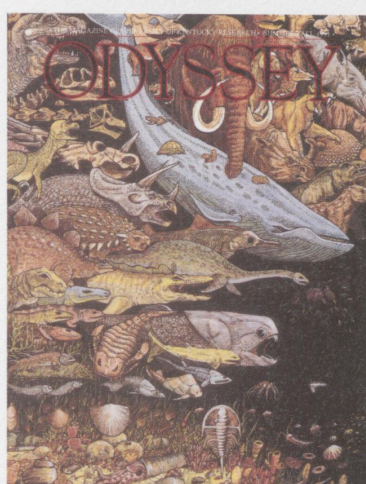
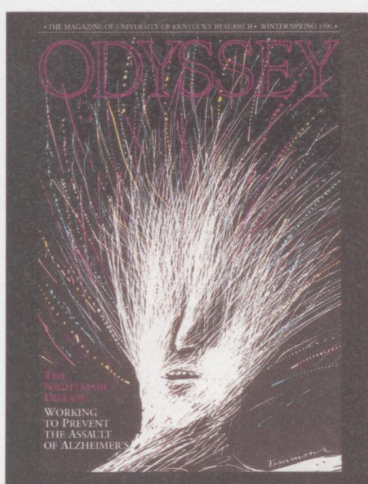
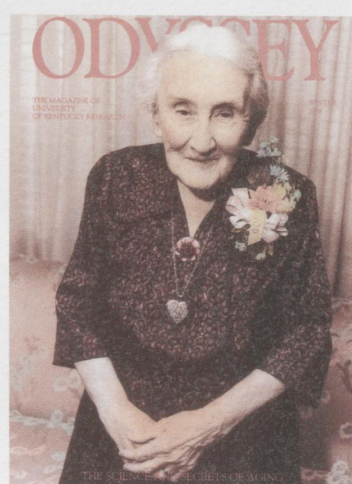
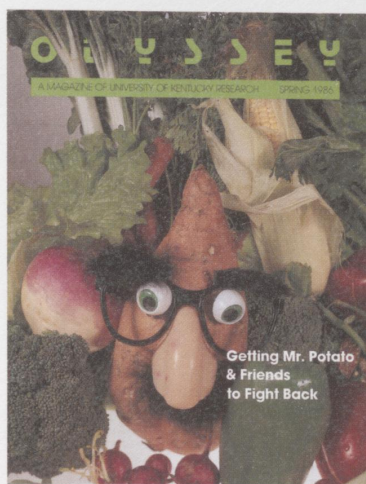
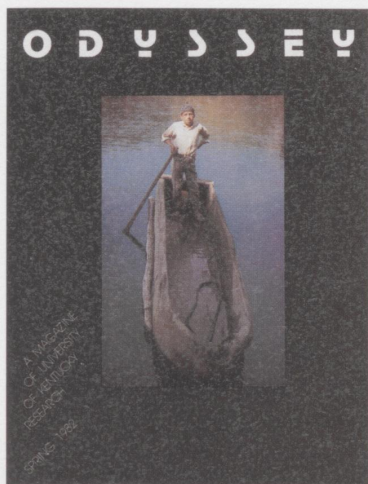
The centenarian study is one of over a dozen articles on the subject of age-related changes that have appeared in the magazine in the past 20 years. *Odyssey* has returned to UK's Sanders-Brown Center on Aging often in an attempt to keep up with new findings from center faculty on aging and associated diseases, especially Alzheimer's.

I admit to a very personal interest in working with faculty who were making new discoveries in this area—in particular Bill Markesbery, Allan Butterfield, and David Snowden. My father showed the first signs of the disease in the early '90s, so I wanted to keep current on both new findings and clinical applications. My understanding of the disease helped my father, early on, to comprehend what was happening to him. As time went by, of course, Alzheimer's—an invisible and relentless thief—robbed him of memory after memory. Dad died of Alzheimer's-related causes in October 2000.

In the past five years, I've been lucky to work with a creative and talented new team—Deb Weis as director of our office (research communications) and Alicia Gregory as associate editor of the magazine and our Web guru. And it's been gratifying to see the work of our tiny staff of three be recognized with awards for design and writing.

Odyssey counts on our faculty for information and illumination, and we count equally on the support and encouragement of the UK administration, especially the Office of the Vice President for Research, which funds the magazine. And we thank all of the university's friends across the country—all our readers—for your interest in and support for research and creative activity at the University of Kentucky.

Jeff Worley
Editor



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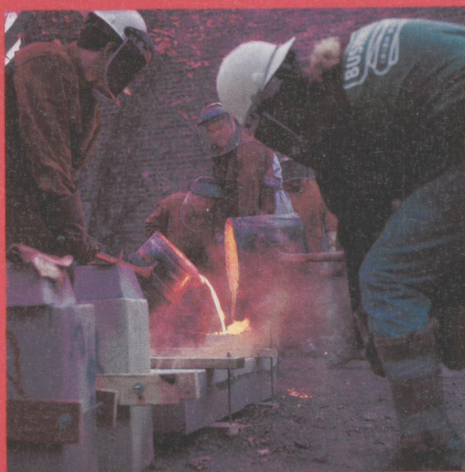
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*Noteworthy Prima Donna Enjoying
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